REMOTE SASKATCHEWAN COMMUNITY ENERGY OVERVIEW STUDY

Prepared for

ENERGY, MINES AND RESOURCES CANADA

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REMOTE SASKATCHEWAN COMMUNITY ENERGY OVERVIEW STUDY

Executive summary

The Remote Community Demonstration Program was introduced in 1982 as part of the federal government's oil-off initiative. Part of the program involves assessing the scope for conservation and for alternative energy supplies by developing a comprehensive data base and screening approaches to reduce oil use. Other aspects of the program involve more detailed study of potentially attractive options in remote communities and implementation of demonstration projects.

Basically, the program defines a "remote community" as one that has at least 10 permanent residences, at least five years of planned life remaining and is not now connected to or firmly committed to connection with piped natural gas or provincial electrical grids. When work on this study began, 15 communities in Saskatchewan met the definition. However, Saskatchewan Power Commission has since announced that five will be connected to its grid. Since information on these communities had already been collected, the report includes them (Dillon, Michel Village, Patunak, Pinehouse and St. Georges Hill). It should be noted, however, that only the remaining 10 are eligible under the program (Black Lake, Brabant Lake, Camsell Portage, Deschambault Lake, Fond du Lac, Garson Lake, Kinoosao, Southend, Stony Rapids and Wollaston).

These communities all depend on diesel fuel for electricity generation and on heating oil or propane for space heating in institutional and commercial buildings. Wood, rather than heating oil or propane, is the main source of energy for residential space heating, cooking and water heating.

In the 10 Saskatchewan communities designated as remote, the population of 3,452 used 276,065 GJ of energy in 1982 for all purposes other than transportation. With the high cost of that energy, the report examines a number of potential alternative energy options for each community. Depending on the community, small hydro (under 5MW), wood gasification or grid connection was usually the best choice. The report describes in detail each community and its energy use.

The energy resource base of Northern Saskatchewan is surveyed in general terms. Potential small hydro-electric sites are indicated; forest, peat and wind resources are reviewed; and extension of the electrical grid is discussed. Opportunities for reducing oil consumption through energy conservation are also reviewed.

Appendices explain the following technologies: small scale and micro hydro, wood conversion, wind-electric conversion systems, and synthetic fuels from biomass.

ETUDE GENERALE CONCERNANT L'ENERGIE DANS LES COLLECTIVITES ELOIGNEES DE LA SASKATCHEWAN

Résumé pour la direction

Le Programme de démonstration dans les collectivités éloignées a été lancé en 1982 par le gouvernement fédéral, dans le cadre de ses activités pour remplacer le pétrole. L'un des volets du Programme consiste à évaluer le domaine d'application des économies d'énergie et des approvisionnements énergétiques de rechange, en établissant une base de données générale et en sélectionnant des moyens de réduire la consommation de pétrole. D'autres aspects du Programme concernent l'étude plus détaillée des options qui peuvent s'avérer prometteuses dans les collectivités éloignées et la mise en oeuvre de projets de démonstration.

Aux fins du Programme, une "collectivité éloignée" est essentiellement définie comme étant une agglomération qui compte au moins 10 habitations permanentes, qui est établie pour cinq autres années au moins et qui n'est pas, ou ne sera vraisemblablement pas, raccordée au réseau de distribution de gaz naturel par pipe-line ou au réseau provincial de distribution d'électricité.

Lorsque cette étude a été mise en marche, 15 collectivités de la Saskatchewan correspondaient à la définition. Toutefois, la "Saskatchewan Power Commission" a annoncé depuis que cinq collectivités seront raccordées à son réseau. Etant donné que l'information avait déjà été recueillie, ces cinq collectivités sont incluses dans le rapport (Dillon, Michel Village, Patuanak, Pinehouse et St. Georges Hill). Il convient de noter toutefois que seules les 10 autres sont admissibles en vertu du Programme (Black Lake, Brabant Lake, Camsell Portage, Deschambault Lake, Fond-du-Lac, Garson Lake, Kinoosao, Southend, Stony Rapids et Wollaston).

Toutes ces collectivités dépendent du combustible diesel pour la production d'électricité, et du mazout domestique ou du propane, pour ce qui est du chauffage des établissements et des commerces. Le bois, plutôt que le mazout domestique ou le propane, est la principale source d'énergie pour cuisiner et chauffer les habitations et l'eau.

Dans les 10 collectivités de la Saskatchewan identifiées comme étant éloignées, la consommation d'énergie en 1982 pour un population qui compte 3 452 habitants est évaluée à 276 065 GJ pour tous les usages autres que le transport. Etant donné le coût élevé pour l'énergie, un certain nombre de solutions de rechange applicables ont été examinées pour chaque collectivité. Selon la collectivité, une petite centrale hydro-électrique (moins de 5 MW), la gazéification du bois ou le raccordement au réseau a généralement constitué le meilleur choix. Le rapport décrit en détail chaque collectivité et sa consommation d'énergie.

Le capital-ressource énergétique du nord de la Saskatchewan est examiné de façon globale. Des sites possibles de petites centrales hydro-électriques sont indiqués; les ressources provenant de la forêt, de la tourbe et du vent sont passées en revue; et le prolongement du réseau de distribution d'électricité est examiné. Les occasions de réduire la consommation de pétrole par le biais de l'économie d'énergie y sont également examinées.

Les annexes expliquent les techniques suivantes: les petites et très petites centrales hydro-électriques, la conversion au bois, les systèmes de conversion à l'électricité et à l'énergie éolienne et la production de combustibles synthétiques à partir de la biomasse.

I. INTRODUCTION CHAPTER I

1.1 The North - An Overview

The majority of residents in northern Saskatchewan have a historical and cultural base which takes them back beyond the time period of today's villages and settlements. Their basis for survival in this severe climate and remote environment, has very much been a sensitive balance of understanding the limits to which man can impose his will for change, while still satisfying his goals for survival. Understandably, change has been slower in this region than in most other parts of Canada. Until the mid 1940's, most settlement areas were recognized simply by the fact that a number of temporary shelters were located around Hudson Bay Trading Posts or Catholic Missions.

Residents either hunted, fished or trapped as a means of economic subsistence. Dependence upon energy resources, apart from one's ability to provide from the land at this time, was minimal.

In the mid 1940's a number of federal programs, such as the Family Allowance Act, were passed, which began to guarantee social services to all Canadians. As a result of this increased awareness of the north, two major government agencies (The Department of Indian Affairs and Northern Development and The Department of Northern Saskatchewan) established administration centres and sub-agencies throughout the area. In the 1950-60's, northern settlements began to establish themselves on a more permanent basis. Schools, hospitals, roads and airstrips were constructed. Housing programs were initiated and electric service was distributed to certain locations.

During the 1970's and 1980's, northern groups became more organized, as did the agencies who were responsible for supplying services to them. Uranium and mining exploration increased substantially during this time and have had a major effect upon both the economy and overall accessibility to the north. However, many of the residents have not responded as quickly or as positively to the increased progress.

Communication links, health, education and recreation needs have generally had a positive impact upon all residents. It is important to remember, however, that any changes or modifications in technology and available resources, generally have a much greater effect on the life style of residents who live in remote communities and who may still be predominantly dependent upon the hunting, fishing and trapping resources of their land base. This dependence on a land base, coupled with settlement living and a desire to upgrade services, has resulted in a need to increase both material goods and energy resources to accessible and non-accessible northern settlements.

A successful approach to investigating alternative energy options and conservation techniques, must, therefore, respect both lifestyle goals and cultural values, in conjunction with economic conditions, and available technologies. It is with this thought in mind that Underwood McLellan Ltd. and Eneraction Resources Limited have approached the initial phase of this Overview Study.

It is to be appreciated that the authors acknowledge this study as merely a beginning. Successful Phase II programs will depend upon an individual indepth analysis of the social, environmental and economic factors for each community.

The authors would finally like to acknowledge the generous assistance and co-operation which was provided by the numerous individuals and agencies who have served as resource guides for each individual community. Without this assistance, the task of assembling the data presented could certainly have been more formidable than it was.

CHAPTER 2

2. DEMOGRAPHICS - PERSPECTIVE AND COMMUNITY SETTLEMENT PATTERNS

2.1 Overview

Remote northern communities are distinctively unique from their southern counterparts by virtue of being more isolated and dependent upon a land base for economic and social stability. In addition their population base, growth rates and age mixtures are also significantly different.

Of the fifteen communities studied, the population base ranged from a low of 61 persons in Camsell Portage to a high of 720 in Black Lake. In general, the populations are relatively stable and appear to increase at approximately 2-5% annually. Many of the communities will double in size within 10 years. Both fertility and mortality rates are higher in the north than southern centres, thus it is unique that in the majority of northern settlements, the number of persons younger than 19 is often greater than 50% of the total community. In contrast, the number of elders is very low, as a percentage of the overall scale.

Migration does not appear to be as significant an issue in the north as in the south. The pressure of the economics of living in this location generally does not outweigh the inherent desire to live in the familiar community with friends and family. As a result of the high percentage of young people in these communities who are approaching the family formation and child rearing stage, the sudden increase in demand for housing and support facilities will greatly increase. This issue is most significant in terms of future planning for issues affecting northern residents and communities.

Table 2.1

Population Summary

	Community	Total Population	Percentage Growth	Population Under 20 years of age
1.	Black Lake	720	3%	435/720 - 60.4% 19 or younger
2.	Brabant	129	2-3%	72/129 - 56.0% 17 or younger
3.	Camsell Portage	61	3%	28/61 - 46.0% 19 or younger
4.	Deschambault	517	3%	214/517 - 41.4% 19 or younger
5.	Dillon	411	2.75%	216/411 - 52.5% 19 or younger
6.	Fond du Lac	540	3%	328/540 - 60.7% 19 or younger
7.	Garson Lake	84	3%	48/84 - 57.1% 19 or younger
8.	Kinoosao	81	--	50/81 - 61.7% 19 or younger
9.	Michel Village	116	3%	57/116 - 49.1% 19 or younger
10.	Patuanak	678	2.5-3%	278/678 - 41.0% 17 or younger
11.	Pinehouse	648	2.5%	395/648 - 61.0% 19 or younger
12.	St. George's Hill	115	2%	67/115 - 58.3% 19 or younger
13.	Southend	528	3-4%	296/528 - 56.0% 17 or younger
14.	Stony Rapids	249	2.5%	125/249 - 50.2% 19 or younger
15.	Wollaston	543	4-5%	323/543 - 59.5% 19 or younger

There appears to be no distinct correlation between population and energy consumption in these communities. This may be attributed to the fact that, while a similar economic base exists for all, some communities serve as quasi service centres for the area.

On an overall Sector Basis, residences stand out as the largest consumer of energy. The scope of opportunities for energy savings in this sector is dealt with at greater length elsewhere in this report, but it is felt that there is little to be gained by looking to alternate fuels. The energy demands of the average residence are fairly constant and simple - generally a function of the weather and the living patterns of its inhabitants. Both of these do not change appreciably with time. Greater savings are to be had by retrofitting and optimizing residential construction to meet the demands of northern living.

CHAPTER 3

3. ENERGY USE IN THE REMOTE COMMUNITIES

3.1 Remote Community Demonstration Program (RCDP)

.1 Introduction and Terms of Reference for Overview Study

"The Department of Energy, Mines and Resources Canada has undertaken to investigate and demonstrate the use of alternative energy sources and conservation measures for remotely located communities in Canada. Most of these communities currently use diesel fuel for generation of electrical energy. In most cases, the electrical consumption includes lighting, mechanical energy and some space heating. A further portion of the space heating requirement may be met by imported heating fuel oil or propane. This investigation represents a preparatory step in decreasing the dependence of these communities on imported fossil fuels and, where economically viable over the medium and long term, replacement of these energy sources with locally available renewable and nonrenewable sources."

"The Program will be implemented over a four-year period to March 31, 1986 and has received an authorized funding level of 24 million dollars. From these funds, ten million dollars has been dedicated to the Yukon and the Northwest Territories. To meet its objectives, the Program has been divided into two complementary phases."

"Phase One will provide funds during fiscal year 1982/83 and 1983/84 towards approved studies by eligible applicants from or associated with energy supply, management and use in the Saskatchewan remote communities. The type of studies which will receive consideration are those which will permit assessment of off-oil options available to remote communities in the context of specific energy technologies, conservation measures, supply options and projects which may be considered from implementation under Phase Two of the Program, or separately under other federal and provincial programs, and private and public sector initiatives."

"Phase Two of RCDP will provide funds during fiscal years 1983/84 to 1985/86 in support of demonstrations of specific or alternate energy supply and energy conservation projects and measures. This phase will provide for the demonstration of mature technologies and techniques, as well for promising new technologies which appear to have particular relevance to remote communities. The purpose of demonstration projects under Phase Two of the Programs is to make remote communities with common energy supply and energy demand management (conservation) options aware of feasible techniques, technologies, and measures and the means of putting these into place."

This overview study which presents the community energy supply and demand profiles will serve three functions:

1) as background information for eligible communities and applicants submitting RCDP proposals,
2) for the Department of Energy, Mines and Resources in evaluating these proposals, and
3) in assisting the Department of Energy Mines and Resources plan and manage the Program.

3.2 Saskatchewan Remote Communities

.1 Study Communities

In total, fifteen Northern Saskatchewan communities have been identified as "remote communities" at the onset of this Study. They have all satisfied the following criteria as presented in the original terms of reference for this overview study:

- The community is not presently or firmly committed to be connected to a piped natural gas supply.
- The community is not presently or firmly committed to be connected to the provincial grid electrical distribution system.
- The community relies on oil based products for electrical generation and some space heating.
- There are at least 10 permanent (or long term) residences.
- The community is a permanent and long term (5 years or more) settlement.

The remote communities are as follows:

1. Black Lake
2. Brabant Lake
3. Camsell Portage
4. Deschambault Lake
*5. Dillon
6. Fond du Lac
7. Garson Lake
8. Kinoosao
* 9. Michel Village
*10. Patuanak
*11. Pinehouse
*12. St. Georges Hill
13. Southend
14. Stony Rapids
15. Wollaston

* (Notice that these communities will be connected to the S.P.C. grid was announced in March 1983). However, as the information base for these communities had already been prepared, they were still included in this Study.

Figure 1 illustrates the geographic location of the communities considered in this study.

Of the remote communities reviewed in this report:

- 6 are accessible by all-weather road (Brabant Lake, Deschambault Lake, Dillon, Patuanak, Pinehouse, Southend).
- 2 are accessible by winter road (Michel Village, Wollaston).
- 2 are accessible by intermittent road (Kinoosao, St. George's Hill).
- 5 are isolated, only accessible by air, or, in some cases, by summer barge. (Black Lake, Camsell Portage, Fond du Lac, Garson Lake, Stony Rapids).

In terms of status and responsible jurisdiction the fifteen communities are either:

a) Only Indian reserves, under the jurisdiction of Prince Albert, D.I.A.N.D., District Office,

- Black Lake

or:

b) Joint use under the jurisdiction of an LAC and the Prince Albert D.I.A.N.D., District Office,

- Fond du Lac
- Southend
- Wollaston
- Deschambault

or:

c) Only Indian reserves under the jurisdiction of the Meadow Lake, D.I.A.N.D., District Office,

- Dillon

or:

d) Joint use under the jurisdiction of an LAC and the Meadow Lake, D.I.A.N.D., District Office,

- Patuanak

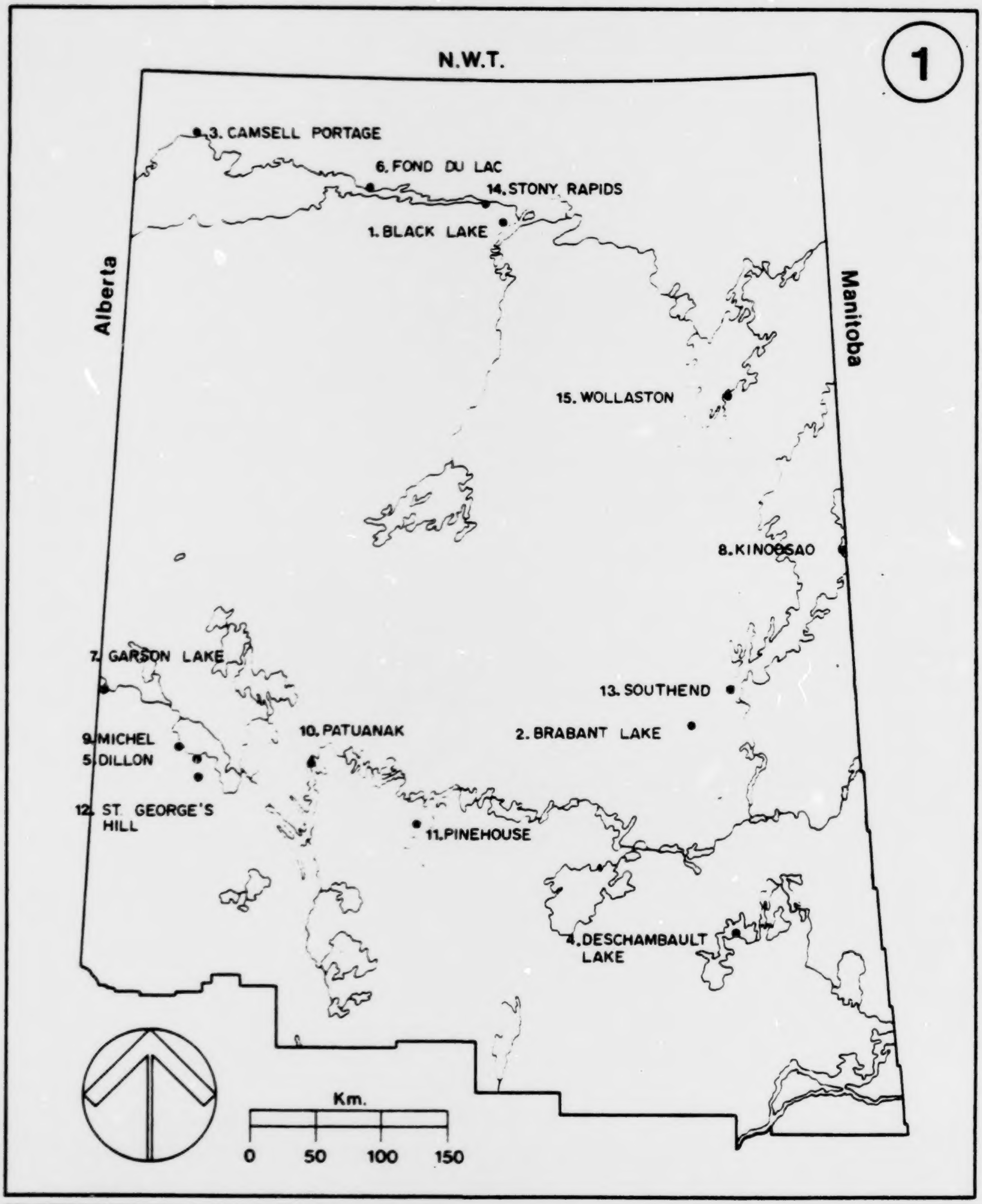
or:

e) Only local Advisory Councils managed through Prince Albert DNS and other government offices.

- Brabant Lake
- Camsell Portage
- Garson Lake
- Kinoosao
- Michel Village
- Pinehouse (LCA)
- St. Georges Hill
- Stony Rapids

.2 Electrical Service

Currently, all but one of the communities under study are provided with power from Saskatchewan Power Corporation diesel sets. The community of Garson Lake has a diesel


1
N.W.T.
Alberta
Manitoba
3. CAMSELL PORTAGE
6. FOND DU LAC
14. STONY RAPIDS
1. BLACK LAKE
15. WOLLASTON
8. KINOOSAO
7. GARSON LAKE
13. SOUTHEND
2. BRABANT LAKE
9. MICHEL
5. DILLON
10. PATUANAK
12. ST. GEORGE'S HILL
11. PINEHOUSE
4. DESCHAMBAULT LAKE
Km.
0
50
100
150

Remote Communities
NORTHERN SASKATCHEWAN
Remote Community Energy Study

generator owned and maintained by the Northern Lights School Board which is used exclusively for school related facilities.

As noted earlier, notification of communities which would receive a hook up to the grid was formally announced in March, 1983. These communities include: Pinehouse, Patuanak, St. George's Hill, Michel Village and Dillon.

3.3 Overview

A summary of the various energy consumption patterns (by sector) is given in Table 3.1. Whereas the individual community energy profiles have outlined total annual consumption, in terms of source fuel utilization, Table 3.1 attempts to give a complete overview of the breakdown by end-use sector. Table 3.2 provides the same information, but examines the total Source Fuel consumption for each community. Table 3.3 identifies the portion of each Source Fuel associated with a particular sector.

In comparing the data, it can be seen that certain similarities begin to emerge in the percentage consumption for each of the sectors. Education and Residential are the heavy users, with an average of 25.6 and 57.8% of the total respectively. Almost all of the communities' Education energy usage is derived from Fuel-Oil, while the Residential sector relies heavily on wood to meet its needs. The Education Fuel-oil usage (as is similar for other institutional buildings) is devoted entirely to building heating. The residential use of fuel-wood, on the other hand, is split between building heating, cooking and water heating.

Next to these, Commercial Buildings and Communications consume an average of approximately 7 and 5% respectively, of total energy use, by sector. Electricity and Fuel-Oil are the dominant fuels here, going toward building heating, lights and the operation of equipment.

The rest of the sectors use an average of 1 to 4% of total.

On an overall Source Fuel basis, Electricity stands out as the most heavily used form of energy, followed closely by Fuel-Oil and Wood. These account for 40.7%, 30% and 24.8% respectively of all energy consumed in one year by the Communities in this report. The use of propane is somewhat minimal in the north, probably due to prohibitive costs.

There appears to be no distinct correlation between population and energy consumption in these communities. This may be attributed to the fact that, while a similar economic base exists for all, some communities serve as quasi-service centres for the area.

On an overall Sector Basis, residences stand out as the largest consumer of energy. The scope of opportunities for energy savings in this sector is dealt with at greater length elsewhere in this report, but it is felt that there is little to be gained by looking to alternate fuels. The energy demands of the average residence are fairly constant and simple - generally a function of the weather and the living patterns of its inhabitants. Both of these do not change appreciably with time. Greater savings are to be had by retrofitting and optimizing residential construction to meet the demands of northern living.

Table 3.1

Energy Profile Summary: Total Community Energy Consumption

Annual Source Fuel Consumption - Basis 1982 Facilities

Community	Education		Health		Protection		Communi-cations		Transport Services		Government		Community Services		Commercial		Residential		Community Total	
	GJ	%	GJ	%	GJ	%	GJ	%	GJ	%	GJ	%	GJ	%	GJ	%	GJ	%	GJ	%
Black Lake	4,026	11.8	787	2.3	----		2,258	6.6	----		----		3,019	8.9	4,548	13.4	19,427	57.0	34,065	100
Brabant Lake	2,793	30.5	----		----		493	5.4	----		77	0.8	38	0.4	973	10.6	4,779	52.2	9,153	100
Camsell Portage	1,137	5.5	----		----		1,430	6.9	----		576	2.8	1,458	7.1	21	0.1	15,977	77.6	20,599	100
Deschambault Lake	1,2658	38.5	1,332	4.0	53	0.2	920	2.8	----		----		1,896	5.8	1,692	5.1	14,364	43.6	32,915	100
Dillon	6,362	23.8	200	0.8	217	0.8	2,356	8.8	----		----		1,335	5.0	3,037	11.4	13,188	49.4	26,695	100
Fond du Lac	17,512	30.6	----		287	0.5	2,822	4.9	----		----		4,089	7.1	15,191	26.6	17,312	30.3	57,213	100
Garson Lake	2,117	43.2	----		----		----		----		----		----		----		2,788	56.8	4,905	100
Kinoosao	1,448	18.4	----		----		----		----		436	5.5	403	5.1	644	8.2	4,943	62.8	7,874	100
Michel Village	3,183	31.2	232	2.3	----		575	5.6	----		----		133	1.3	----		6,071	59.6	10,194	100
Patuanak	9,412	28.3	----		56	0.2	1,083	3.3	----		----		1,513	4.5	2,813	8.4	18,428	55.3	33,305	100
Pinehouse	9,390	19.9	480	1.0	705	1.5	1,377	3.3	----		1,499	3.2	3,952	8.4	6,254	13.2	23,353	49.5	47,210	100
St. George's Hill	3,890	40.7	89	0.9	----		437	4.6	----		368	3.9	200	2.1	299	3.1	4,267	44.7	9,550	100
Southend	8,044	27.2	1,145	3.9	----		2,345	7.9	----		486	1.6	1,935	6.5	2,444	8.3	13,194	44.6	29,593	100
Stony Rapids	6,776	14.2	1,439	3.0	4,125	8.7	2,641	5.5	3,830	8.0	5,399	11.3	261	0.5	3,691	7.7	19,508	40.9	47,670	100
Wollaston	5,419	15.1	749	2.1	813	2.3	2,999	8.4	----		1,475	4.1	3,875	10.8	2,105	5.9	18,476	51.5	35,908	100

Table 3.2

Energy Profile Summary: Total Community Energy Consumption (By Source Fuel)

Annual Source Fuel Consumption - Basis 1982 Facilities

Community	Electricity		Fuel Oil		Propane		Wood		Total	
	GJ	%	GJ	%	GJ	%	GJ	%	GJ	%
Black Lake	12,515	36.7	8,242	24.2	270	0.8	13,038	38.3	34,065	100
Brabant Lake	4,287	46.8	1,548	16.9	120	1.3	3,198	34.9	9,153	100
Camsell Portage	16,658	80.9	1,781	8.6	438	2.1	1,722	8.4	20,599	100
Deschambault Lake	15,467	47.0	8,012	24.3	1,564	4.8	7,872	23.9	32,915	100
Dillon	13,360	50.0	6,075	22.8	372	1.4	6,888	25.8	26,695	100
Fond du Lac	14,482	25.3	22,253	38.9	9,900	17.3	10,578	18.5	57,213	100
Garson Lake	--	--	1,625	33.1	--	--	3,280	66.9	4,905	100
Kinoosao	3,684	46.8	1,742	22.1	152	1.9	2,296	29.2	7,874	100
Michel Village	5,065	49.7	1,161	11.4	360	3.5	3,608	35.4	10,194	100
Patuanak	14,579	43.8	10,139	30.4	223	0.7	8,364	25.1	33,305	100
Pinehouse	17,659	37.4	16,178	34.3	1,401	3.0	11,972	25.4	47,210	100
St. George's Hill	3,768	39.5	2,787	29.2	289	3.0	2,706	28.3	9,550	100
Southend	14,478	48.9	7,315	24.7	1,814	6.1	5,986	20.2	29,593	100
Stony Rapids	14,081	29.5	23,375	49.0	210	0.4	10,004	21.0	47,670	100
Wollaston	15,675	43.7	9,908	27.6	895	2.5	9,430	26.3	35,908	100

Table 3.3

Energy Profile Summary - Total Source Fuel Consumption

Total Annual Source Fuel Consumption - Basis 1982 Facilities

Sector	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	32,826	47,757	12,433	1,148	94,164
Health	1,901	2,787	1,765	--	6,453
Protection	1,898	3,251	1,107	--	6,256
Communications	21,936	--	--	--	21,936
Transport Services	811	3,019	--	--	3,830
Government	2,746	7,276	294	--	10,316
Community Services	11,673	11,415	117	902	24,107
Commercial	14,979	26,316	285	2,132	43,712
Residential	76,988	20,320	2,007	96,760	196,075
Total	165,758	122,141	18,008	100,942	406,849

CHAPTER 4

4. FUEL PRICING

4.1 Liquid Fuels

Table 4.2 gives a summary of the various Liquid Fuel costs (including cartage) for the communities mentioned in this report. Transportation fuels (gasoline, diesel) have been omitted for the following reasons:

a) There are no real opportunities for dollar savings by replacing transportation fuels with alternate fuels, since present technology makes it difficult to do so.

b) It is difficult to determine the amount of transportation fuel actually consumed within the community.

c) Communities with road access may obtain their transportation fuel from any number of locations.

The oil prices shown, reflect the rates charged to meet heating and diesel-electric generation requirements. The diesel-electric fuel rate is that of the lowest bidder for the supply contract in any given year, and doesn't necessarily relate to current fuel prices. For example, the 1983 prices in some communities are 5-20% lower than those for 1982. The bulk rate shows the slight discount that may be had through volume buying, as in the case of those consumers who own large storage tanks.

The consumer rate is the price paid by residents and some commercial enterprises. At this rate, oil is normally sold in 205 litres (45 gallon) drums, or in some cases, by the litre.

Propane is sold as a liquid fuel in either bulk or bottled form. The bulk rate, with its attendant discounts, is usually offered to customers with large, on-site, storage tanks (e.g., schools, health facilities). The bottled rate is the price paid by residents or other small consumers. Sold in 100 pound bottles (containing 91 litres each), these containers are either delivered, full, to consumers, or else filled by the residents themselves at the nearest filling station (typically Buffalo Narrows or La Ronge).

Naptha and Kerosene - In the past naptha was sold directly from 205 litre (45 gallon) drums. Now, it is usually sold in 4 litre cans (many of which now, no doubt, litter the north). This fuel is used mainly in the bush, for heat, cooking and lighting. Kerosene is used mainly in the bush for the same purposes, and is usually sold from 205 litre (45 gallon) drums.

4.2 Wood

For most communities, wood is collected by the individual residents for their own use, on a needs basis. In some communities, there is a central area where wood, cut in 1.2 m lengths, is made available to the general community. Some have a special service for senior citizens, where wood is cut, split and stacked for about $35 per cord.

In most cases the wood is green, non-seasoned or collected from burnout areas at the time of use.

4.3 Electricity

The electrical rates for diesel-generator serviced communities may be summarized in Table 4.1. These are divided into three categories of consumer, depending on the level and type of usage.

Residential customers are generally, not allowed to have any large appliances, electric heat or other potentially heavy electric loads. By and large, electricity for cooking is discouraged, but many use it anyway.

Table 4.1
Electricity Rates

Service	Monthly Rate
Residential	$4.05 plus $0.0346/KWH for the first 315 KWH plus $0.165/KWH thereafter
Commercial	$5.25 (includes first 30 KWH) plus $0.069/KWH for next 420 KWH plus $0.23/KWH thereafter
Government Commercial	$0.33/KWH (minimum $10.00)

Table 4.2

Fuel Pricing by Remote Community - Price Per Litre ($/l)[5]

Community	Oil			Propane			
	North-Sask Electric	Bulk Delivery	Consumer	Bulk Delivery	Bottled	Naptha	Kerosene
Black Lake	See Note 1	0.3863	0.3863	N/A[3]	0.247	N/A	N/A
Brabant Lake	0.2542	0.3554	0.3750	0.30	0.33	N/A	N/A
Camsell Portage	0.3722	0.3910	0.3910	N/A	0.472	N/A	N/A
Deschambault Lake	0.2532	0.3375	0.4130	0.300	0.2424[2]	1.57	0.598
Dillon	0.2944	0.3820	0.4100	.0260	.0318	2.04	N/A
Fond du Lac	0.3722	0.3770	0.3770	N/A	0.247	2.42	N/A
Garson Lake	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kinoosao	0.2852	--	0.5100	--	--	0.88	1.50
Michel Village	0.2542	0.3960	0.4100	0.260	0.318	N/A	N/A
Patuanak	0.2522	0.3430	0.3430	0.260	--	2.50	N/A
Pinehouse	0.2502	0.3347	0.4090	0.306	0.385	0.656	0.539
St. George's Hill	See Note 4	0.3960	0.3960	0.260	0.318	N/A	N/A
Southend	0.2522	0.375	0.375	0.306	0.330	1.33	0.48
Stony Rapids	0.3722	0.3640	0.3640	N/A	0.659	1.28	N/A
Wollaston	0.2852	0.3829	0.4730	0.303	--	0.792	0.572

Notes:

1. Black Lake derives its electrical power from Stony Rapids, hence an oil price of 0.3722 may be used.
2. Price for bottled propane at these communities reflects the fact that it is not delivered, but picked up at the nearest outlet.
3. N/A means not available.
4. St. George's Hill derives its electrical power from Dillon, hence an oil price of 0.2944 may be used.
5. Price includes Cartage Costs.

CHAPTER 5

5. ASSESSMENT OF ALTERNATIVE ELECTRICAL GENERATION TECHNOLOGIES

5.1 Introduction

This section summarizes information presented in the data base of this report. Promising technologies that could be used as a substitute to diesel-electric generation are identified and ranked. Ranking is based on a number of components, including: the existing resource base, state of the art technology (as presented in appendix 1) and cost to deliver this technology. The ranked position of any one technology is based on assessments made by the study team with the information presented in this report and should not be considered definitive. Further investigation, as might be carried out in Phase I of the Remote Communities Demonstation Program, should provide a much clearer indication of feasibility.

A second portion of this section presents a brief overview of the impact of 1st ranked alternatives on each community.

5.2 Evaluation of Alternative Electrical Generation Options

In the ten communities designated as "remote" in Saskatchewan, a total of 2,170,000 litres of fuel oil was used in 1981 to produce 5,456 MW of electrical energy. Total fuel costs amounted to approximately $621,000. Given this high fuel cost, a number of potential alternative energy options were examined for each community. Table 5.1 presents feasible options for each community and a relative ranking of attractiveness based on factors outlined in the introduction of the chapter. Alternatives not noted, are considered unfeasible at present.

TABLE 5.1

SUMMARY AND RANKING OF FEASIBLE ALTERNATIVES TO DIESEL GENERATED ELECTRICITY IN REMOTE SASKATCHEWAN COMMUNITIES

Community	Rank	Description	Comments
Black Lake/ Stony Rapids	1	Hydro-Electric	Excellent potential - 4 sites
	2	Grid Extension	Line from Uranium City - Service could be extended to Rabbit Lake
	3	Wood Gasification	Good Potential - extensive fire-kill areas
Brabant Lake	1	Wood Gasification	Good potential
	2	Hydro-Electric	Good potential - further site investigation required.
	3	Grid Connection	Only feasible if electrical grid extended north to Rabbit Lake
Camsell Portage	1	Grid Extension	Construction of line from Charlott River Dam (15 km)
	2	Wood Gasification	Rough terrain may limit access to Wood resources
	3	Wind/Diesel	Further investigation required
Deschambault Lake	1	Wood/Peat Gasification	Good potential - fuel peat reserves yet to be identified
	2	Grid Connection	Extension of southern grid from Pelican Narrows via Jan Lake
	3	Hydro-Electric	May be potential - south arm Pelican Lake
	4	Wind	May be potential - further investigation required
Fond du Lac	1	Transmission Line from Stony Rapids	Establish centralized generation facility at Stony Rapids
	2	Grid Extension	Line from Uranium City - Also servicing Stony Rapids, Black Lake and possibly Rabbit Lake
	3	Hydro-Electric	Good potential - 4 possible sites
	4	Wood Gasification	Good potential - extensive fire-kill areas
Garson Lake	1	Wood/Peat Gasification	Good potential - fuel peat reserves yet to be identified
Kinoosao	1	Wood Gasification	Good potential - further assessment of reserves required
	2	Grid Extension	Line extension from Lynn Lake, Manitoba (100 km)
Southend	1	Hydro-Electric	Excellent potential - site at Whitesand Dam
	2	Wood Gasification	Good potential
	3	Wind	May be feasible - site on Big Island, south of community
Wollaston	1	Wood Gasification	Good potential - further assessment of reserves required
	2	Wind/Diesel	May be feasible site 800 m east of airstrip

5.3 Overview of 1st Ranked Alternativess by Community

5.3.1 Black Lake/Stony Rapids: Hydro Electric Generation

Based on available hydro-electric potential, electricity could be provided for Black Lake, Stony Rapids and Fond du Lac at any one of the four sites examined. Woodcock Rapids or Elizabeth Falls seem the most attractive sites.

It is likely that with ranked options 1 or 2, power could be provided at central grid rates, and restrictions on high load uses (electric stoves, dryers, electric heating) would no longer be required. Overall consumption of electricity could be expected to increase substantially to levels comparable to or greater than existing southern grid communities of similar size. A two or threefold increase in demand and peak load is likely.

Based on projected 1983 consumption, 750,000 litres of fuel for diesel generation could be saved for the communities of Black Lake and Stony Rapids. If Fond du Lac is connected to the same power source, an additional 366,000 litres of fuel could be saved. However, the decrease in fuel use may have a negative impact on the availability and cost of fuels for other uses within the communities. All fuels are brought in by barge. A reduced fuel demand of 1,116,000 litres of diesel fuel for these communities could seriously affect the economics of scale required for barge traffic.

Ultimately, barge traffic may be unfeasible or considerably more expensive. The only other access to the community is via air transport.

While preliminary studies have been conducted for the Woodcock Rapids and Elizabeth Falls sites, environmental impacts have not been determined and may significantly affect the feasibility of development. A general overview and environmental assessment of development of these sites conducted by SPC indicated that:*

- the area contains significant fish spawning grounds
- Elizabeth Falls is a significant archaeological site
- development may increase forest fire risk
- 100 different birds make the area their habitat
- Middle Lake is a Whistling Swan nesting area (an endangered species)

5.3.2 Brabant Lake: Wood Gasification

A 75 - 100 kw wood gasification plant installed at Brabant Lake could save up to 135,000 litres of fuel oil that is traditionally utilized for diesel-electric generation. It is likely that the existing diesel sets could be converted to run on wood gas. However, backup diesel capacity would be required to ensure continued electrical services during periods of maintenance and shutdown on the gasifier. While conversion to wood-gas generated electricity would reduce non-renewable fuel use, it is not clear whether wood-gas generated electricity would be any cheaper than diesel generated electricity. The cost involved in harvesting and processing wood feedstock can have a critical effect on the economics of a gasifier operation.

A gasifier of the size noted above, would probably require two full time operators and would employ 2 - 3 people over a four month period, in order to harvest the wood. Despite the cost of wood harvest, funds allocated for fuel collection would be recycled back into the community (in terms of employment), rather than out of the community (as in the case of diesel generated electricity). Wood resources appear to be adequate in the area surrounding the community. Highway 102 provides ready access to extensive foest reserves.

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*Saskatchewan Power Corporation, Northern Hydro Development Economic Feasibility of Small Hydro in the Black Lake Area

5.3.3 Camsell Portage: Grid Extension From Uranium City

The Charlott River dam and hydro-electric station is approximately 15 km from the community of Camsell Portage. Impacts of a line extension to the community are positive, in terms of providing cheaper rates and non-restricted electrical use (e.g. use of 220 volt appliances). However, the terrain between the community and the dam site is very rugged and construction of a transmission line may impose cost premiums. The fuel savings resulting from the grid extension is estimated to be 83,500 litres annually.

A potential negative factor that may influence this option, is the continuing decommissioning of the mine at Uranium City. Three hydro-electric plants currently operate in the general area and provide a total capacity of 23.5 MW. The absence of a large scale consumer for this area may lead to eventual shutdown of the power facility. In addition, a major water retaining dyke on the northwest shore of Tanzin Lake is apparently in need of major repair in the near future, if the hydro stations are going to remain in operation.

5.3.4 Deschambault Lake: Wood/Peat Gasification

While fuel grade peat has not as of yet been identified in the area surrounding Deschambault Lake, it is highly likely that significant reserves do exist. A gasification plant with a capacity of 200 - 300 KW would supply present and future electrical needs for the area and save approximately 400,000 litres of oil annually. Diesel sets would likely remain in the community to act as backup to the gasification system two people would be required (full time) to operate the gasifier and 3 - 5 temporary positions would be necessary to harvest the wood or peat fuel over a four month period.

A sawmill already exists in the community and it is possible that some of the equipment may be suitable for wood fuel harvest.

5.3.5 Fond du Lac: Transmission Line to Stony Rapids

This option assumes that it is most efficient to centralize an electrical power source at Stony Rapids. Greater economics of scale may be possible for diesel-electric operation and this option can compliment any proposed hydro-electric development: the installation of a transmission line from Uranium City or the construction of a centralized wood gasification/electrical generation facility for the communities of Fond du Lac, Black Lake and Stony Rapids.

If a transmission line is constructed along the southern shore of Fond du Lac, a road connecting the community to Stony Rapids may be constructed at the same time.

5.3.6 Garson Lake: Wood/Peat Gasification

A gasifier with 50 KW generation capacity would likely be suitable for Garson Lake. Peat has been identified as a potential feedstock for a gasifier, however, fuel peat reserves have not as of yet been identified in the Garson Lake area.

Two full time positions would be required to operate the gasifier and 2 - 3 temporary positions would be required to harvest the necessary fuel over a 3 - 4 month period. All positions would be filled by local labour. It is not clear at the this time whether the overall cost to produce electricity via the gasification/internal combustion process will be less than is presently incurred by northern communities.

In Garson Lake, electrical power is only available to the school. A gasification plant would be able to supply additional electricity for residences not presently serviced.

Forest resources surrounding the community appear more than adequate.

5.3.7 Kinoosao: Wood Gasification

The appraisal of wood gasification as a suitable power source for Kinoosao is based on very preliminary investigation. Further study of the wood reserves around the community would be necessary to determine true potential. To supply current and future electrical demands within the community, a 50 - 75 kw plant would be required. Two local full time operators would be required and 2 - 3 temporary positions would be available for a 3 - 4 month period, annually, in order to harvest the wood required. A full time gasification plant would replace the 100,000 litres of fuel currently used for diesel electric generation. Funds spent on wood harvest and gasifier maintenance would be recycled back into the community, rather than funneled to an outside fuel oil dealer. Further investigation would be required to determine any possible negative environmental effects.

5.3.8 Southend: Hydro-Electric Generation

The Whitesand dam offers an excellent site for a small scale hydro-electric installation. Because a dam already exists at this site, construction costs for a hydro-electric plant may be significantly lower than a comparable plant built from scratch.

More than enough power is available at this site to satisfy existing and future community electrical demands. Environmental impacts may also be minimized because modifications of the stream have already taken place during initial construction of the dam.

The Whitesand dam regulates water flow into the Churchill river system as part of a large scale power development plan that presently includes Island Falls and a number of other proposed sites.

5.3.9 Wollaston: Wood Gasification

Positive community impacts would include the creation of two full-time jobs to maintain the gasifier and three to four month employment for two to five people to harvest the annual wood feedstock required. If a plant of sufficient size were constructed, (say 300-400 kw in order to accommodate growth), residents may be able to utilize 220-volt appliances and electric heating due to increased load capability. It is unclear whether the costs of generating power would be sufficient to reduce electrical rates. The economic feasibility of the plant is highly dependent on the actual costs involved in harvesting, storing and drying the wood or peat fuel. However, a distinct advantage to the gasifier is that money spent for wood harvest is funneled back into the community, rather than to an outside fuel dealer.

Wood resources in the general area appear to be adequate but further environmental study would be required to determine ideal harvesting methods and to ensure that wood harvest does not interfere with the traditional collection of wood for home heating and cooking. An extensive burn area is located about 10 km south of the community and could be accessed via Wollaston Lake.

CHAPTER 6

6. OPPORTUNITY FOR CONSERVATION IN REMOTE SASKATCHEWAN COMMUNITIES

6.1 Introduction

It was the original intention of this report to document specific conservation opportunities, evaulate costs of implementation and to provide a profile of the most attractive opportunities available to each community. Upon completion of the data collection phase, it was realized that information related to building conditions and general thermal performance was unavailable from the extensive list of sources contacted by the study team. It was concluded that information in sufficient detail to allow for a accurate profile and ranking of conservation opportunities, could only be gained from actual site visits and energy auditing of the various premises. Overall, the amount of travel required and the degree research necessary was concluded to be far beyond the scope and intent of this study.

As a result, this Chapter outlines in general terms, opportunities identified by the study team that are available to remote Saskatchewan communities to save energy and importantly, to reduce energy costs.

By southern Saskatchewan standards, the remote communities studied in this report are not excessive energy users. For example, the average residential electrical consumption in the north is 1/4 to 1/3 that of southern residents. Over 80% of residential space heating in the north is based on wood fuel (a renewable resource). In addition, most houses built in the north since 1973 are constructed to high energy efficiency standards (R20 walls, R40 ceilings).

Only a few of the communities have sewer and water service and of these communities, a small minority actually have indoor plumbing. Energy use as it relates to the provision of services, is well below that incurred in southern communities of similar size. Overall, the majority of remote community residents, faced with depressed economic conditions and high energy prices, live in a state of energy frugality that would be unacceptable to most Canadians.

Opportunities for conservation fall into two basic sectors for northern communities. Residential and service related facilites.

6.2 Conservation And Housing In the North

In this study, it was difficult to accurately estimate the opportunities for energy conservation through retrofit and renovation, that could exist in each community.

The majority of information collected was via telephone and personal correspondence. No allowances were made for travel to the respective communities and, as a result, site inspections and home energy audits were not possible. Some information is availabale however, on the type of housing constructed in the north and its general condition. In addition, some communities have just begun surveys of building conditions, (Fond du Lac, Black Lake, Stony Rapids).

Housing built with government assistance (the majority of housing in the north) has been built to high insulation standards since 1973 (RSI 3.6 walls, RSI 7.2 ceilings). A total of 135 homes of this calibre have been built in the northern remote communities. However, homes specifically built by the Department of Indian and Northern Affairs (DIAND) have only been built to the above standards since 1981. Approximately 40 homes of this type have been built on reserve lands in the study communities over the past two years. The remainder of homes in the north can be expected to be of 2 x 4 construction, insulated generally to standards of 2.2 RSI in walls and 3.6 RSI in ceilings.

Housing built by DIAND is limited to a total cost per house of $22,150, not including transport allowances. Of this amount $12,000 is designated towards construction materials, $8,000 is for labour and the remainder is for installation of services such as wiring and plumbing. In contrast, houses built by the Saskatchewan Housing Corporation (SHC) generally cost $50,000 to $60,000, with costs increasing as building sites move farther north.

It is not clear whether this cost differential has a direct effect on the relative energy efficiency of the building structures. In the case of DIAND housing, because strict budgets must be adhered to, a high proportion of unskilled labor is involved in the construction process. Because of this, detailing involved in the installation of vapour barriers, installation of adequate insulation and proper caulking, can, in some cases be substandard.

Interviews with numerous northern residents and government officials, indicate that a prime target area for conservation in existing housing are homes with uninsulated or improperly insulated crawl spaces and homes with substandard levels of insulation in ceilings and walls. Moisture damage on walls and ceilings also seems to be a common complaint, which may be the result of inadequate or substandard vapour barriers, insulation levels or perhaps improper treatment of the house. Further investigation is needed.

Table 6.1 presents a portion of the results of a housing needs study conducted by the Department of Northern Saskatchewan in 1976. While it concentrates on the Northern Administrative district as a whole, it is the best indicator at this time of housing conditions in Saskatchewan Remote communities. By the table we can see that approximately 80% of northern housing in 1976 was in good condition, the rest requiring major repair or replacement. This indicates that there may be substantial opportunities to thermally upgrade a large percentage of the housing stock while carrying out general home improvements. It would be useful to carry out energy audits on homes designated for renovation in each community in order to maximize the possible benefits from upgrading the structure.

TABLE 6.1

CROSSTABULATION OF SURVEYED HOUSING STOCK BY BUILDING CONDITION: INTERIOR AND EXTERIOR

	Interior Condition			
	Good	Needs Major Repair	Structurally Unsound/Needs Replacement	Total
Exterior Condition				
Good	473	51	-	524
Needs Major Repair	31	389	1	421
Structurally Unsound/ Needs Replacement	1	4	56	61
TOTAL	505	444	57	1,006

Source: Department of Northern Saskatchewan, Northern Saskatchewan Housing Needs Survey Report, 1976-77

Another opportunity for conservation in the north is through conversion of heating systems from oil to wood or wood/oil combination furnaces. In the homes built in the northern administrative district by the Department of Northern Saskatchewan since 1973, the installation of home heating is broken down below. Figures identifying heating facilities in pre 1973 is not available.

TABLE 6.2

HEATING SYSTEMS INSTALLED SINCE 1973

IN DNS HOUSING

IN THE NORTHERN ADMINISTRATIVE DISTRICT

Furnace	Number of Units	Percentage of Total
Oil	642	47%
Wood/Oil	693	50%
Wood Electric	22	2%
Electric	10	1%
TOTAL	1367	100%

NOTE: These figures include all communities located in the north of the province and homes built between 1973 and 1982.

SOURCE: Correspondence with D.N.S., Northern Housing Branch

As can be seen in Table 6.2, a number of oil fired furnaces are presently installed in northern homes. Interviews conducted as a part of this study revealed that, while a number of homes had oil furnaces, few were in use. Many residents have bought inexpensive wood heaters and have discontinued the use of their oil furnaces. No firm figures are available, however the trend appeared to be widespread throughout the remote communities. With a few exceptions, all DIAND housing is heated with wood. The vast majority of wood-heated homes use inexpensive tin fabricated stoves, often referred to in the north as "air tight stoves". Their efficiency is low, generally in the 15 - 30% range. There is a possibility that these stoves could be replaced with more efficient and legitimately air tight models. However, the vast majority of northern residents burn green wood, that could cause cresote buildup in more efficient units. It is the opinion of the study team that major lifestyle changes would necesarily be required to result in the widespread use of seasoned wood fuel.

Housing associated with government services in the north are generally high energy users. Homes are heated with oil, electricity or propane is used for cooking. Until recently, all heating and electrical costs were absorbed by the employer. This practice often lead to indiscriminent and excessive energy use. Most service agencies are now providing a fuel allowance to employees. They are now responsible for purchasing their own fuel and are responsible for all expenses exceeding their fuel allowance. Results of this program are not currently available.

6.3 Conservation in the Service Sector

The service sector includes schools, health faciliites, community facilities and commercial enterprises. These sectors are the largest overall energy users of the remote communities. Oil, electricity and propane are all used extensively. Opportunities for conservation therefore exist in reducing heating needs through thermal upgrading and replacing the use of non-renewable imported fuels (oil and propane) with local wood resources.

While this study was able to identify the location and size of various service sector buildings, information on building condition, vintage, insulation levels and overall thermal preformance was generally unavailable to the study team. As a result, no firm conclusions can be made as to the full range of energy conservation opportunities possible. Energy audits of service facilities in each community can provide an excellent base for an ongoing upgrading project.

6.4 Heat Recovery from Electrical Generation Facilities

At present, the only viable source of recoverable heat in northern communities is from diesel generators. A standard 100 kw set, operating at full load, will only perform at approximately 33% efficiency. The remaining 67% is wasted in the form of heat, either to the unit's water jacket, to its exhaust gas system or to the surrounding air. This wasteful situation can only be improved if: (a) strict operation and maintenance procedures are compiled with, (b) the diesel sets are operated close to their rated capacity, (c) heat recovery systems are installed.

It has been found that an improved operation and maintenance schedule could potentially improve a unit's efficiency by 30% for the average generator-set running under adverse conditions.

Running the diesel sets at close to their rated loads produces savings which are evident by looking at any engine's operational characteristics. Generally, the closer an engine runs to its rated capacity, the higher its efficiency will be. This factor has drawbacks, however, in that if all the gen-sets were operating at their rated capacities, there would be no allowance for additional loads or expansion.

Waste heat recovery is a workable option. The technology is there to raise the efficiency of the average unit to as high as 78%. It is estimated that the recoverable waste heat from a 100 kw gen-set could heat 11.9×10^6 L (2,625,000 gallons) of water from 5^{o} C to 50^{o} C (40^{o} F to 12^{o} F) in one year or 1362 L (300 gallons) per hour. The problem inherent in this system is then deciding on what to do with all the heat. Part of the problem lies in the transportation/distribution of this heat. It has been estimated that, beyond 100 metres, auxiliary electric pumps would be required to circulate the hot water from a 100 kw diesel electric set's water jacket. This constraint immediately begins to reduce the efficiency of the overall system.

If one assumes that hot water from gen-sets was made available to buildings, the situation is then further complicated, in that most remote community buildings are not equipped with the type of heating systems that will readily accept a supply of hot water for heating purposes. Wood stoves and oil fired, forced air furnaces are the order of the day, so that one would then need heat exchangers, circulation pumps and heating coils in order for waste heat recovery to be of benefit.

The dispersed siting of homes in remote communities relative to the location of the generator set increases the chances that energy efficiency losses might well offset any potential gains. In the final analysis, the question will be whether or not time and money invested in utilizing waste heat in this manner will be worth it, in terms of energy savings. For the above reasons, the answer will probably be no. Another factor that compounds the situation is that building heating is a very seasonal application. During summer months there is no demand for it.

Large consumers, such as schools or health care facilities, offer a bit of reprieve in terms of their utilization of hot water. They generally need more of it - for longer periods of time - and are not as spread out as a number of houses. However they are generally sited away from diesel sets for reasons of noise and accessibility.

One way in which waste heat may be utilized effectively is for servicing a laundromat facility with showers. The demand for heat is continuous on a year round basis. In most instances such faciliites don't already exist, and so can be sited conveniently to a generator plant. Such facilities would be a desirable asset to northern communities, both from the point of view of services provided and also the local economic development opportunity that they offer.

CHAPTER 7

7. REVIEW OF THE ENERGY RESOURCE BASE OF NORTHERN SASKATCHEWAN

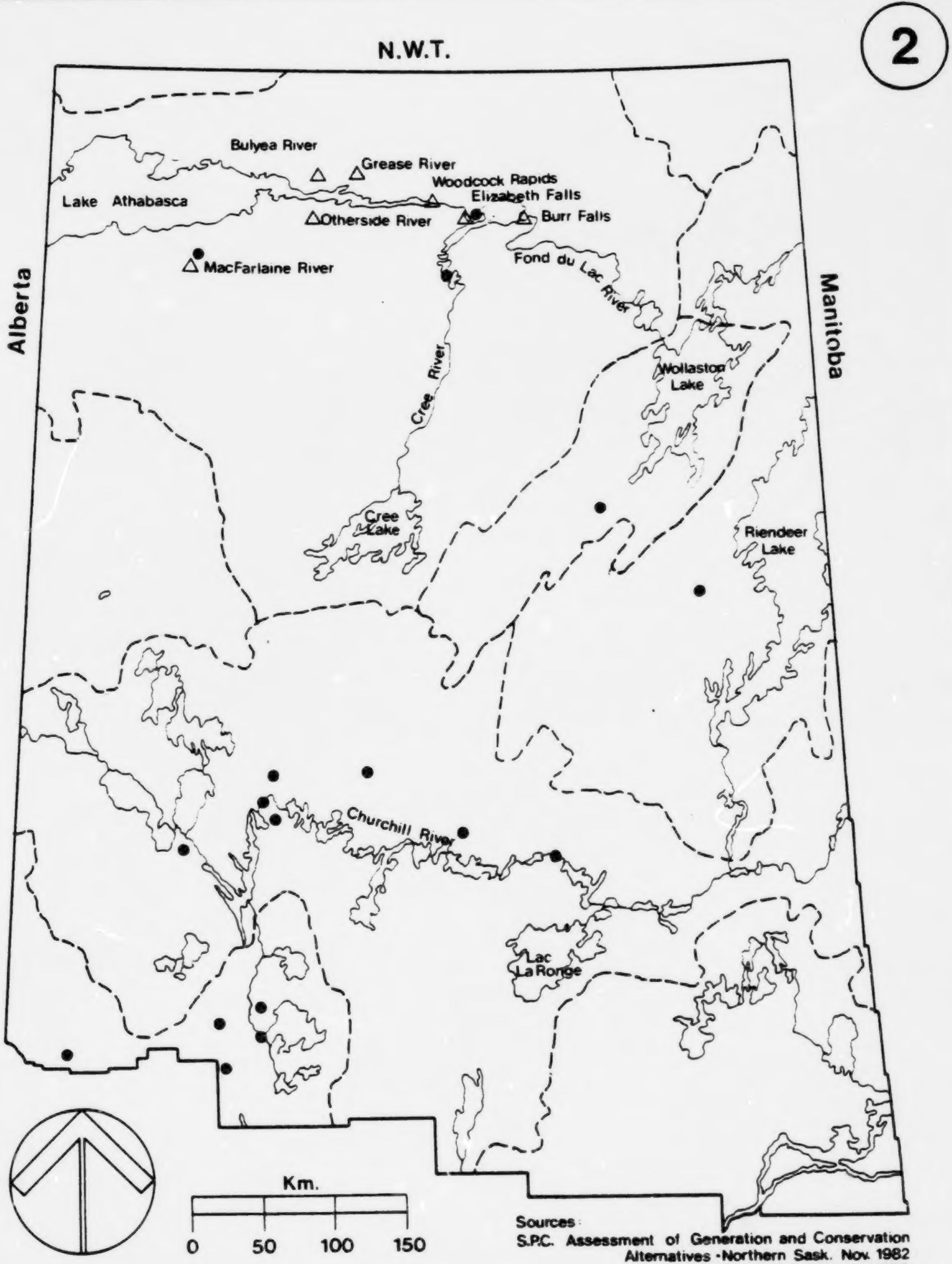
7.1 Background

This section contains a portion of the resource data that has been utilized by the study team in the assessment of alternative energy technologies and energy conservation options. This information, primarily in graphic form, presents a general overview of northern Saskatchewan. Intentionally, only limited text accompanies the figures. Detailed analysis and additional information, where specifically relevant to the remote communities being studied, will be presented in the data base to this report.

7.2 Hydrology and Energy

A major objective of this report is to identify potential small scale (under 5 MW) hydro electric sites within reasonable distance of each community. Figure 2 presents the major drainage basins and stream flow gauging stations located in northern Saskatchewan. Also illustrated are potential small scale hydro electric sites, identified to date by S.P.C. A number of additional potential sites have been identified by the study team and are presented in the individual community profiles located in the data base to this study.

In addition, a detailed review of the technology involved in providing electrical power to remote communities through hydroelectric generation, is reviewed in Appendix I.


2
N.W.T.
Alberta
Manitoba
Lake Athabasca
Bulyea River
Grease River
Woodcock Rapids
Elizabeth Falls
Otherside River
Burr Falls
MacFarlaine River
Fond du Lac River
Cree River
Wollaston Lake
Cree Lake
Riendeer Lake
Churchill River
Lac La Ronge
Km.
0
50
100
150

Sources:
S.P.C. Assessment of Generation and Conservation
Alternatives -Northern Sask. Nov. 1982
Atlas of Saskatchewan 1969

Hydrology and Energy
NORTHERN SASKATCHEWAN
Remote Community Energy Study

Legend

- – – – Drainage Basin Boundary
- △ Location of Potential Hydro Sites
- ● Stream Flow Gauging Stations

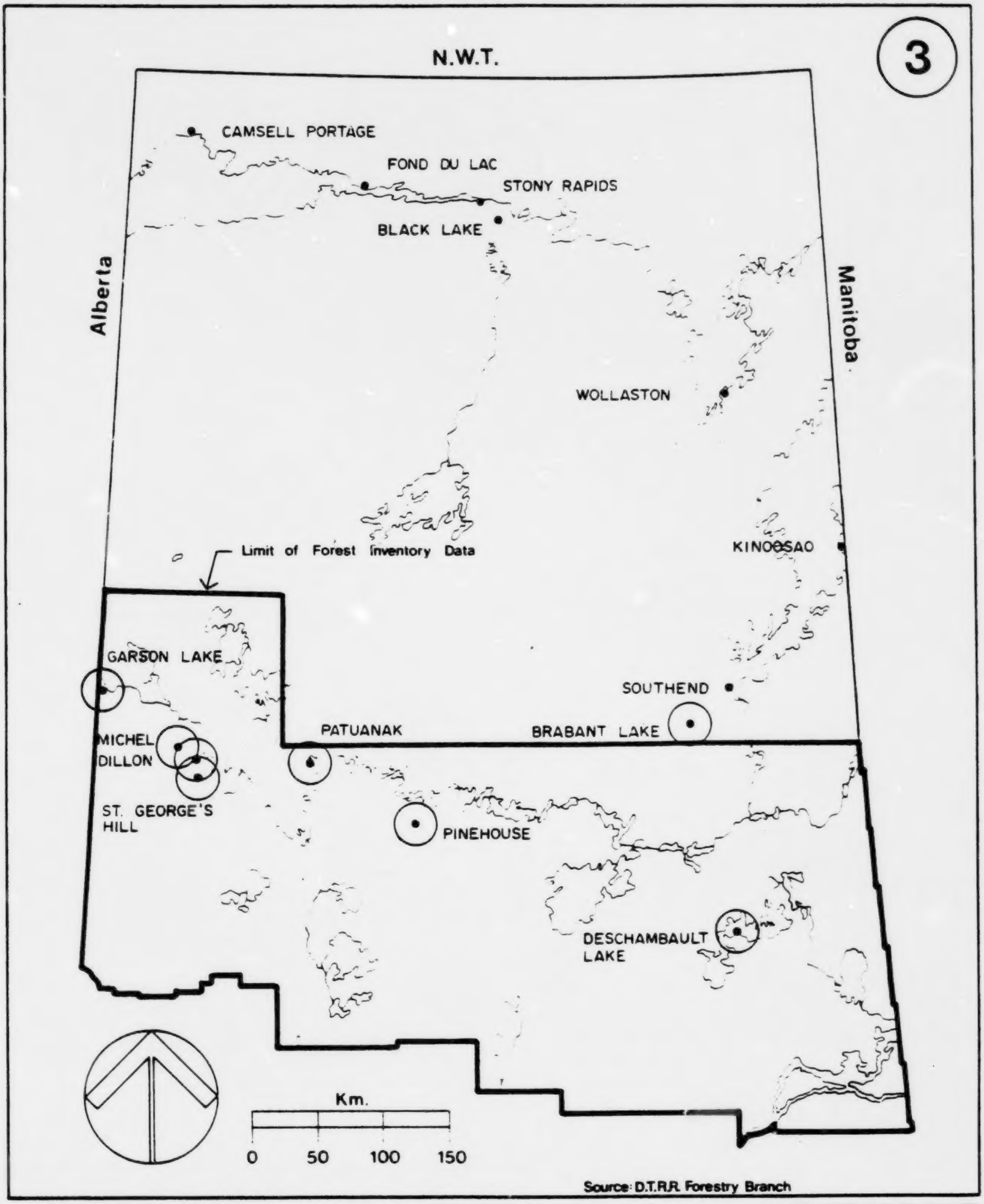
7.3 Forest Resources

The Province of Saskatchewan, although not a major producer of forest products, possesses some one hundred and fifty thousand square kilometres of forest land considered commercially viable. Much of this land is located within the northern half of the province and has traditionally represented a significant resource base for energy employment and building materials for Saskatchewan's remote communities.

Detailed forestry data collection in the province has to date been limited to the commercial forest as depicted within the black boundary in Figure 3. While significant forest reserves exist north of this boundary, no data on species, density or size of forest resources is currently available. However, discussions with numerous authorities indicate that all the remote communities have access to significant long term fuel wood supplies.

Detailed forestry data, within a 16 km radius, is presented in Figure 4 for each community where information is available. Within the forestry inventory area, wood harvest (even for fuelwood) is monitored by permit. Softwoods are considered commercial species suitable for pulp and timber processing. Hardwoods, particularly birch and aspen, are utilized for fuelwood. Forest fire burnout areas are often a significant source of fuelwood for remote communities.

Assessments of individual community wood resources are contained in the data base accompanying this report. A detailed review of the technology involved in wood fuel for power generation is provided in Appendix II.

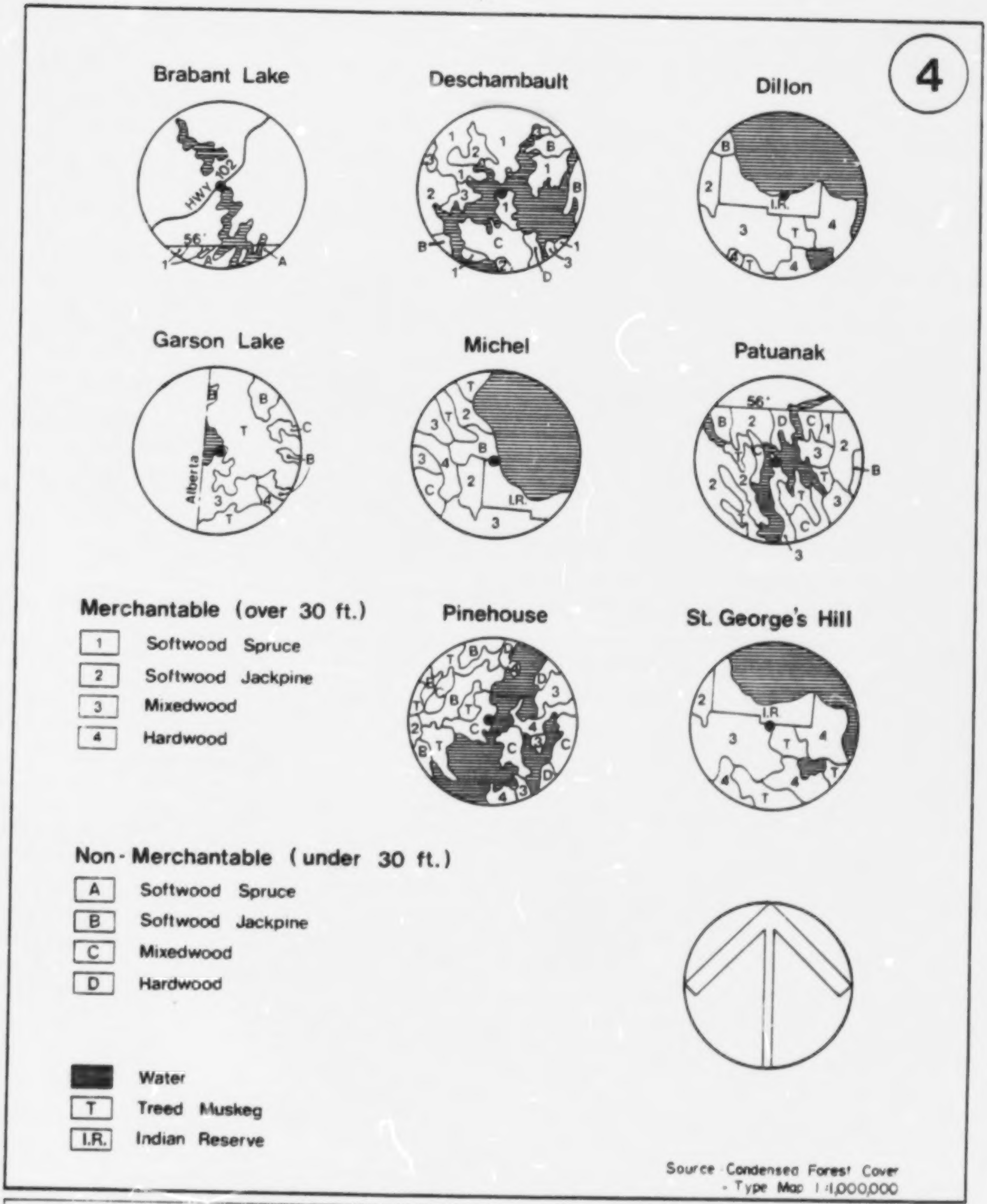

3
N.W.T.
Alberta
Manitoba
CAMSELL PORTAGE
FOND DU LAC
STONY RAPIDS
BLACK LAKE
WOLLASTON
KINOOSAO
Limit of Forest Inventory Data
GARSON LAKE
SOUTHEND
BRABANT LAKE
PATUANAK
MICHEL
DILLON
ST. GEORGE'S HILL
PINEHOUSE
DESCHAMBAULT LAKE
Km.
0
50
100
150

Source: D.T.R.R. Forestry Branch

Forest Inventory
NORTHERN SASKATCHEWAN
Remote Community Energy Study

Legend

⊙ 16 km. Radius
Refer to Following Page for Detailed Description


4
Brabant Lake
HWY 102
56°
Deschambault
Dillon
I.R.
Garson Lake
Alberta
Michel
Patuanak
Pinehouse
St. George's Hill
Merchantable (over 30 ft.)
1 Softwood Spruce
2 Softwood Jackpine
3 Mixedwood
4 Hardwood
Non-Merchantable (under 30 ft.)
A Softwood Spruce
B Softwood Jackpine
C Mixedwood
D Hardwood
Water
T Treed Muskeg
I.R. Indian Reserve

Source Condensed Forest Cover - Type Map 1:1,000,000

Detailed Forest Inventory (16 km. Radius)
NORTHERN SASKATCHEWAN
Remote Community Energy Study

7.4 Peat as a Fuel Resource

7.4.1 Overview

Peat is a resource found throughout the study region. To date, detailed inventory of peat lands has occurred only south of the precambrian shield. Peat resources, however, do exist north of the shield but their extent and suitability as a fuel resource are not currently known. It is estimated that the total surface area of peatlands in Saskatchewan is in the order of 60,000 km^2.*

Figure 5 details the extent of peat lands surveyed in Saskatchewan. Additional detailed studies identifying bogs with fuel grade peat resources have been done both in the La Ronge-Pinehouse and in the Buffalo Narrows areas. A demonstration peat mining project is currently underway just outside of Buffalo Narrows and is operating in conjunction with the testing of three peat fired furnaces within the community.

Peat lands have not been surveyed north of the shield for a number of reasons. A principal factor is the lack of financial resources. In the shield area, peat lands tend to be more scarcely scattered than in the south. In addition, the shield boundary corresponds to the beginning of the discontinuous permafrost, which offers additional technical problems in the mining of fuel peat. However, fuel peat resources do exist in the northern area of Saskatchewan. Native hunters on the barren lands have been known to use peat for heat and cooking.

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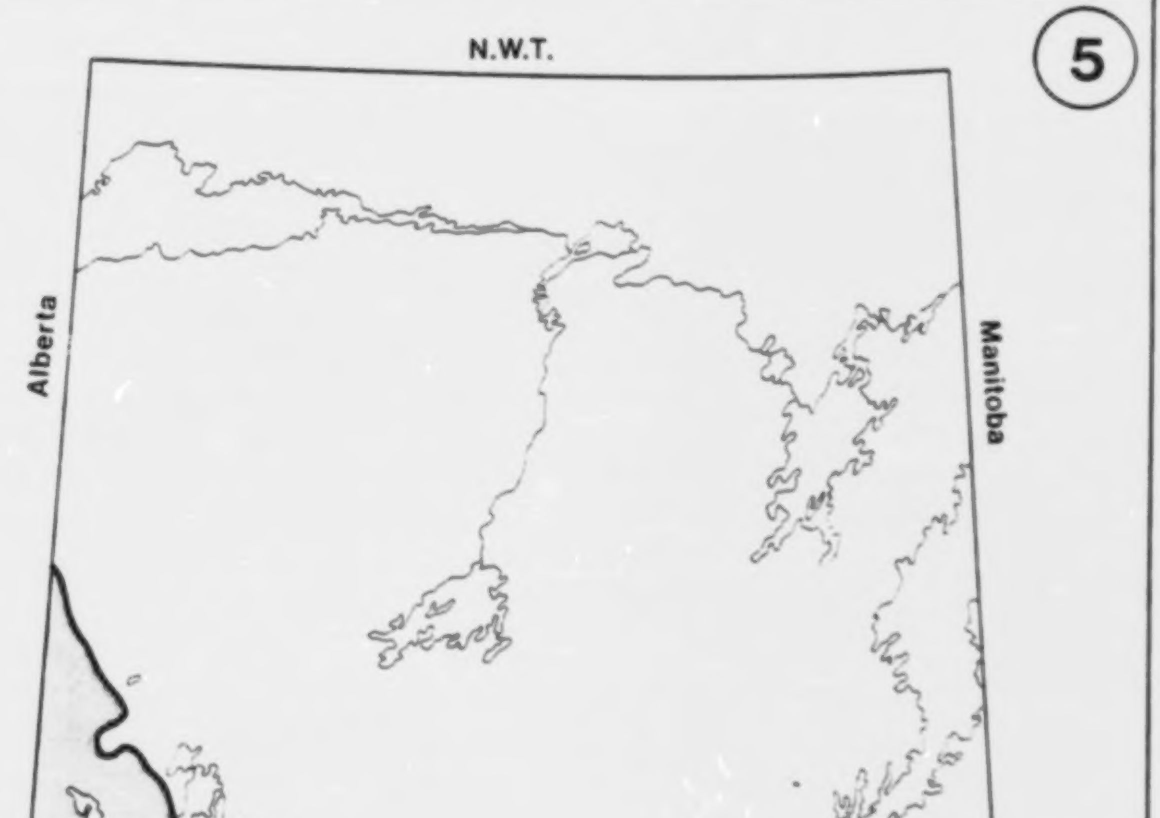
* Saskatchewan Department of Mineral Resources Assessment of the Technical and Economic Feasibility of Peat Resource Development in Northern Saskatchewan Communities, Report 79-2.


5
N.W.T.
Alberta
Manitoba
Precambrian Shield
Km.
0
50
100
150

SOURCE : Peat Resource Development Assessment, Saskmont Engineering Co. Ltd., March 31, 1979.

Potential Peat Areas
NORTHERN SASKATCHEWAN
Remote Community Energy Study

☐ 0 - 20 % Peat Coverage
▨ 20 - 60 % "
■ 60 - 100 % "

7.4.2 Fuel Peat

Only a small portion of the peatlands in Saskatchewan can be considered to be of fuel grade quality. A good fuel peat will usually provide 9.0 to 11.0 MJ/kg on a dry basis. Fuel peat is usually found in deeper bogs .5-1.5 metres below the surface. In comparison, bituminous coal generally has an energy content 25-30 MJ/kg.

In Scandinavian countries, peat has been utilized as a fuel resource for centuries. In some cases large scale thermal electric plants (20 MW) operate solely on peat as a feedstock. Peat can also be used as a home heating or boiler fuel and is also a suitable feedstock for the gasification processes. Despite the advanced state of the art in other parts of the world, peat technology - for mining and combustion in Canada is in its infancy. Considerable research and development is required before peat is a readily usable fuel source.

7.4.3 Vry Methane

Another method of deriving energy from peat is a process called vry methane collection. To date there is no North American experience with this technology and information has proven difficult to obtain. Vry methane involves collecting methane given off through the natural decomposition of peat bogs. A number of plants are apparently operating in Scandinavian and European countries. No further information is currently available within the time constraint provided through this study.

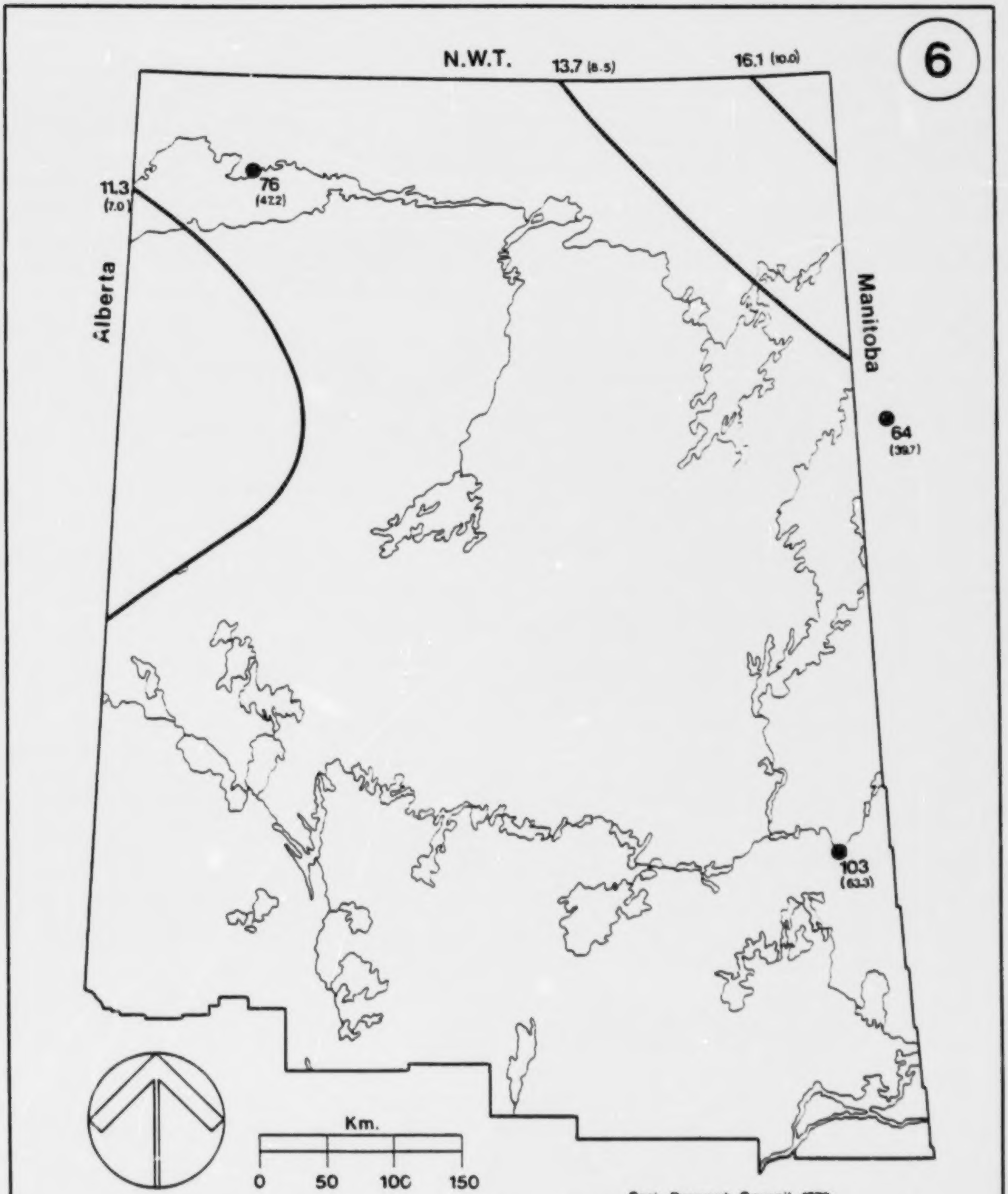
7.5 Wind Resources

Overall, the potential for wind derived electrical power in remote Saskatchewan communities is poor. During the winter months, a southward shifting of the westerly flow of winds across Saskatchewan, results in frequent periods of calm in the northern areas associated with the study communities. These extended calm periods seriously compromise the viability of wind power in the north. Micro-climatic factors, such as topography, relief and vegetation may result in a significant deviation from the above observations for specific sites. Two such sites are presently being studied for the communities of Wollaston and Southend. Further details on these sites are provided in the data base.

The map on the following page presents the general wind regions for the study area. Because this information is based on the observations of only three monitoring stations, the map is useful only in terms of a general overview (Figure 6).

Despite the great amount of research and development that is ongoing, and the number of commercial units on the market, wind power technology is still in the refinement stage of development. It is perhaps inappropriate at this time for application in remote settings. Initial setup and debugging of systems is time consuming. Specialized parts, if required, must be obtained out-of-province and servicing skills, if required, may be difficult to obtain. Overall, while wind power is a promising technology to be considered in the near future, installation in a remote community at this point in time should be considered strictly experimental and therefore subject to the frustrations and additional costs typical of a development technology.

A further technical review of wind power is provided in Appendix III of this Report.


6
N.W.T.
13.7 (8.5)
16.1 (10.0)
11.3 (7.0)
76 (42.2)
Alberta
Manitoba
64 (39.7)
103 (63.3)
Km.
0
50
100
150

Sask. Research Council 1979
Source: Hydrological Atlas of Canada 1978

Wind
NORTHERN SASKATCHEWAN
Remote Community Energy Study

Legend

● Annual Maximum Hourly Wind Speeds (km./hr.)
—— Isotaches Measured 10m. Above Grade
16.1 in km./hr.
(10.0) in mi./hr.

CHAPTER 8

8. FURTHER CONSIDERATIONS: EXTENSION OF THE ELECTRICAL GRID

8.1 Background

An alternative energy source that must be considered for northern communities, particularly over the long term, is extension of the existing electrical grid. Extension of the grid to northern communities has in Saskatchewan been based on cost sharing agreements between the department of Northern Saskatchewan, North-Sask Electric and, where applicable, the Department of Indian and Northern Affairs. This process occurred to five of the study communities during the preparation of this report.

When a community is connected to the grid they are immediately able to take advantage of southern electrical rates. The following table (8.1) presents a very general comparison of rate structure between remote communities and normal Saskatchewan grid electrical rates. In addition to the distinct cost advantage, once a person is connected to the grid, they are no longer discouraged against using higher load appliances such as electric stoves, electric dryers or space heaters.

8.2 Northern Grid Project

The Saskatchewan Power Corporation has conducted initial feasibility studies of extending the southern grid northward to service major resource development projects such as Key Lake, Rabbit Lake and Cluff Lake. These facilities are presently very large energy consumers (1-2 MW) who, at this point in time,

Table 8.1

Comparison of Current Rates Between Remote Communities and Grid Connected Communities

	Remote Community	Grid
Residential		
Basic Charge	$4.05	
Energy Charge	3.46¢/kWH (first 315 kWH) 16.5¢/kWH (for balance of bill)	3.46/kWH
General Service		
	Commercial	General Service II (0-15kW)
Basic Charge	$5.25 (first 30 kW)	$6.80
Energy Charge	6.9¢/kWH (next 420 kWH) 23.0¢/kWH (for balance of bill)	5.60¢/kWH
	Government	General Service III 15-75kW)
Energy Charge	33.0¢/kWH	6.75¢/kWH (for registered demand) 3.04¢/kWH (beyond registered demand)

generate electricity via diesel generation. In servicing these mining developments, a number of remote communities would also be connected to the grid. Figures 7 and 8 detail some of the routing possibilities considered for northern electrification. It should be noted, however, that Saskatchewan Power Corporation has no firm intentions of embarking upon such an expansion program. Necessarily, cost sharing agreements would have to be arranged with the companies involved.

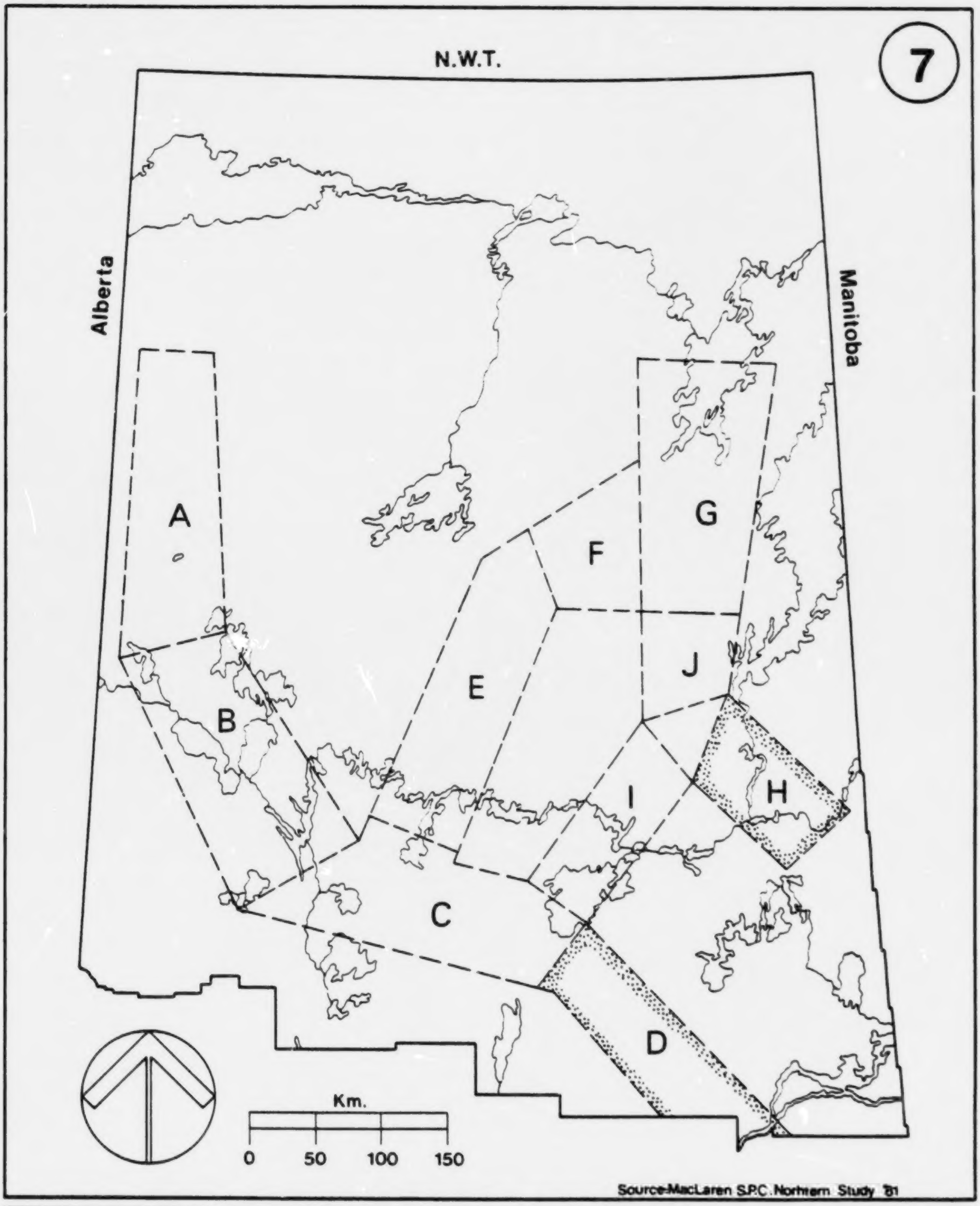
8.3 Community Electrification

On an assumption that at least a portion of the northern grid will be constructed from Island Falls to Rabbit Lake (Sectors H-J-L on Figure 7), North-Sask Electric has made some cost estimates for some grid extensions and improvements as part of their 1982-87 capital budget. While proposals are tentative and cost estimates are considered preliminary, a good general indication of costs associated with various improvements are presented in Table 8.2.

As previously noted, all electrical service improvements are financed through joint funding with various government agencies and private companies. Their implementation is a function of concensus between all parties involved.

8.4 Uranium City Hydro Electric Plants

Eldorado Mining presently owns three hydro-electric generating plants in the vicinity of Uranium City. The available power capacity of 23.5 MW far exceeds the requirements of the remaining settlement. Interest has been expressed on a non-official basis, in determining the feasibility of extending transmission lines from Uranium City to the Athabasca communities of Fond du


7
N.W.T.
Alberta
Manitoba
A
B
C
D
E
F
G
H
I
J
Km.
0
50
100
150

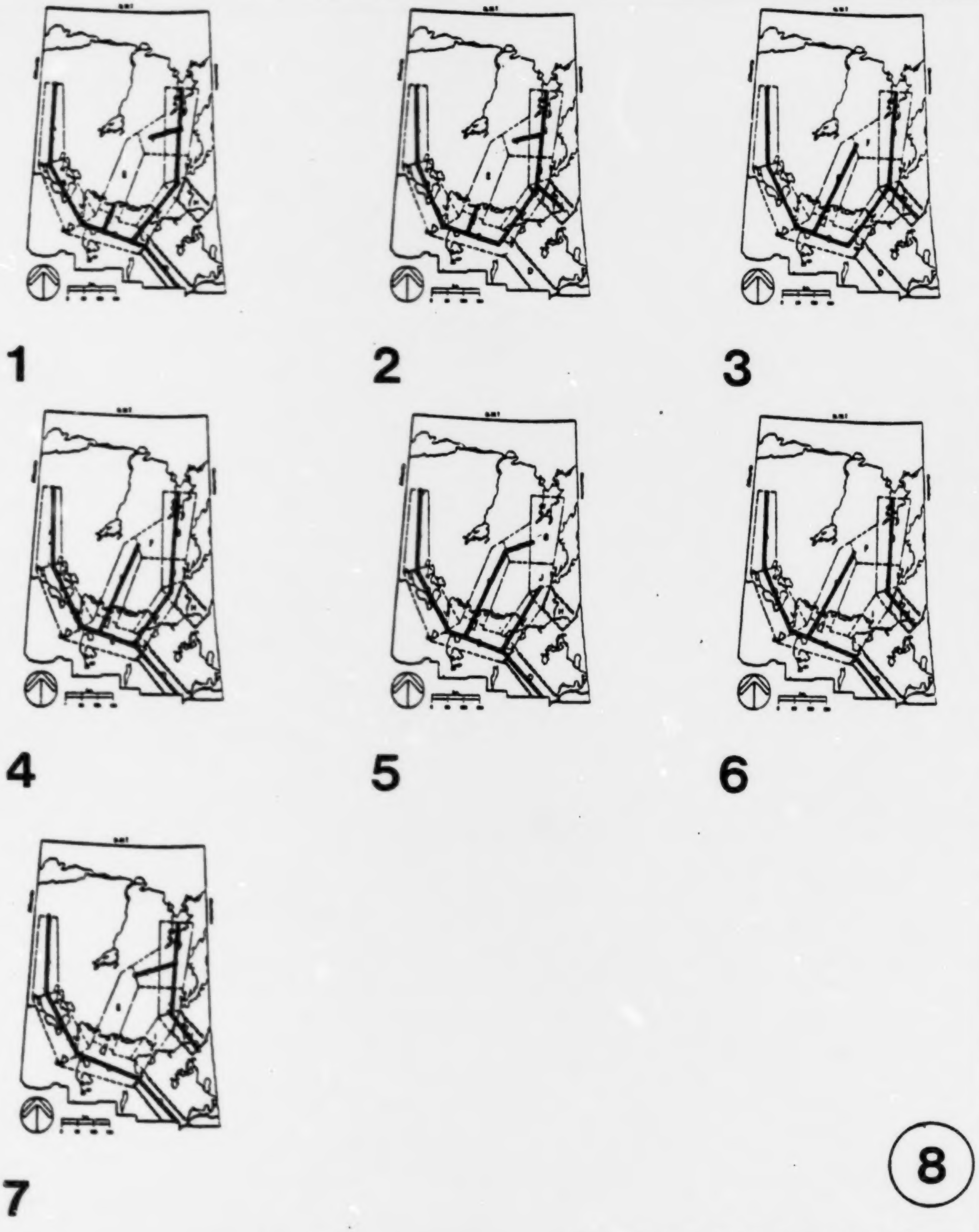
Source-MacLaren S.P.C. Northern Study '81

Northern Grid Extension Alternatives
NORTHERN SASKATCHEWAN

Remote Community Energy Study

Legend

▨ Power Generating Sectors



1 2 3 4 5 6 7

⑧

Source MacLaren S.P.C. Northern Grid Study '81

Feasible Grid Alternatives
NORTHERN SASKATCHEWAN
Remote Community Energy Study

Lac, Stony Rapids and Black Lake. A major constraint to such a project is the cost of constructing a transmission line over the rugged terrain north of Lake Athabasca. Preliminary cost estimates indicate such a line would cost approximately $10 million. Such a line might also be extended to the Rabbit Lake mining facilities as an alternative to northern grid extension (further cost of $10 million).

TABLE 8.2

Proposed Electrical Improvements Affecting Saskatchewan Remote Communities

	Electrical Service Improvements	Capital Cost (1982 $)
A)	Connection of Deschambault Lake to the grid via Pelican Narrows and Jan Lake	$ 1,699,000
B)	Connection of Camsell Portage to the hydro electric plant on the Charlot River (8 km)	$ 248,460
C)	Construction of northern grid transmission line from Island Falls to Rabbit Lake	$28,000,000
D)	Connection of Southend to proposed northern grid line servicing Rabbit Lake (32 km)	$ 3,540,570
E)	Connection of Brabant Lake to proposed northern grid line servicing Rabbit Lake (25 km)	$ 352,980
F)	Connection of Wollaston to proposed northern grid line servicing Rabbit Lake (46 km)	$ 5,168,000
G)	Construction of Power Line from Fond du Lac to Stony Rapids in order to centralize generating facilities at Stony Rapids	$ 1,457,800
H)	Installation of diesel power plants at Garson Lake	$ 95,700
I)	Installation of diesel power plants at Descharme Lake	$ 90,700
J)	Construction of line from Lynn Lake, Manitoba to Kinoosao (100 km)	$ 1,591,385

Source: Pitzel G., Electrification of Northern Communities, Province of Saskatchewan. Prepared for Department of Indian and Northern Affairs, May 1982.

CHAPTER 9

9. INTRODUCTION TO THE DATA BASE

9.1 Background to Community Profiles

The information presented in this section of the report documents the data collected as of February 28, 1983, on the remote communities in Saskatchewan. This section is now being used as the major reference document for the second phase of this study: evaluating alternative technologies and energy conservation opportunities. This data has been presented in Volume I.

Information in each community profile includes: demographic data, socio-economic information, a building inventory, community services, reference maps, and energy utilization data. Also included are the major sources of information for each community. While community profiles have in the past been prepared for northern communities (Institute of Northern Studies 1973 and Northern Saskatchewan Community Directory 1981), never before has this inventory data been combined with legal land use and facility maps. Our profile attempts to convey, not only a feeling of what is at the community, but what the community is like. It is therefore possible to look at a relatively thorough description of a community in both a local and regional context when assessing energy use and consumption.

9.2 Background to Energy Utilization Data

9.2.1 Overview

The three charts presented in Section H summarize the energy consumption characteristics of each of the study communities. Data presented, is based on information provided by North-Sask Electric and extensive telephone discussions and correspondence with community representatives and selected government agencies.

Figures presented should be considered general indicators of magnitude of consumption rather than definitive consumption figures. Fuel use in these communities is influenced by a number of factors including climatic variation, general economic conditions, government and social service initivates.

9.2.2 Electrical Generation Data (H.1)

North-Sask Electric is responsible for generating electrical power in all communities except Garson Lake. Garson Lake has no electrical power source, except for the local school that generates its own power. Section H.1 summarizes diesel electric production statistics for 1981. Some projections with regard to future fuel use and community local growth are also presented.

9.2.3 Community Fuel Consumption Data (H.2)

Table H.2 presents the fuel utilization within the community by fuel type and end use.

In most cases figures are based on 1982 consumption data. In some cases exact utilization data was not available and estimates of energy consumption have been made. Fuel consumotion as it relates to transportation, has not been considered in this report.

9.2.4 Community Primary Energy Utilization (H.3)

This table presents the primary energy input into the community In the case of electrical generation, the energy utilization is expressed as a function of the fuel consumed to generate electrical power. All figures are presented in GJ.

Assumption used with regard to the energy value of different fuels are as follows:

1 litre liquid propane = 0.0272 GJ
1 litre fuel Oil = 0.0387 GJ
1 cord mixed wood - air dried
(Jackpine, birch, aspen) = 16.4 GJ

One litre fuel oil will also produce .00518 to .01066 GJ of electrical energy depending on operation efficiency of the diesel generator plant.

9.3 Energy Resource Data

9.3.1 Background

This section presents general assessments of energy related resources surrounding each community. Information is based on personal interviews, published reports and interpretation of various raw data sources.

9.3.2 Potential Hydro Sites

Potential hydro-electric generation sites deemed capable of providing all, or a significant portion of the electrical demand for the community, that are within a 16 km distance of the community, are identified. In addition, significant sites located just beyond the 16 km limit are described. All sites within 16 km are also identified on the topographical review map provided at the end of each community profile.

All sites were identified after careful analysis of local physical relief, drainage areas, stream flows and water heads available. Sites with generation potential greater than 500 kw are identified with a high degree of confidence. Sites of less than 500 kw potential can be difficult to identify strictly from the mapping and streamflow data available. In addition, the potential, generating capacity of some sites has not been determined due to lack of form information on available head, streamflow, or both. Further investigation of these sites is recommeded.

Where an assessment of potential is presented, it is based on the average annual minimum daily discharge of the watercourse. This, in effect means that the stated level of power potential is available year round. Additional capacity may be available at certain other times of the year.

Information on some sites has been provided by Saskatchewan Power Corporation.

9.3.3 Wood Resources

Assessment of wood resource availability is presented for a 19 km radius for each community and is primarily drawn from a recent Saskatchewan Power Report entitled "The Social, Environmental and Resource impact of Wood Classifaction on Isolated Northern Communities". This information was augmented by information provided by the Forestry Branch, Tourism and Renewable

Resources and through personnal conversations with local residents and D.N.S. resource officers in each community (now Department of Tourism and Renewable Resources).

In the case of all communities, firewood was found to be gathered on an individual, and periodic basis. Green wood, or firekill was most often utilized for cooking and heating. Softwoods, such as Jackpine and Spruce seemed to be favoured as a fuel species because of the ease with which it could be harvested and split. Cut or split wood, reviewed as a valuable resource, was used as quickly as possible, rather than stored or seasoned. Seldom were residents found to have more than a 2-3 week supply of wood on hand, at any one time.

As best as can be determined from the various interviews, it was concluded that the most widely utilized wood stove was the tin fabricated "airtight" (not really airtight) stove that typically retails for $40-$70. Valley comfort woodstoves, and combination wood oil furnaces were found to be present in some past 1973 D.N.S. housing and residences, associated with government or commercial services within the community.

In this section, cords refer to solid cords of wood. A solid cord is equivalent to 2.55 m^3 of solid wood. The equivalent amount of wood stacked, is presumed to occupy 3.62456 m^3 of volume. For the purpose of this study, it was assumed that fuelwood consumption averaged 8 cords per year per household. This figure is based on extensive interviews with various residents of the north who heated their homes with fuel wood. However, in all cases residents were only able to give estimates of fuel use. The practice of gathering wood every 2-3 weeks and the varying quality of the wood available (e.g., green, firekill, etc.), made it difficult to accurately estimate wood volumes consumed. Other studies have shown that northern wood consumption can be as high as 17 cords annually.* Overall, the wide range of housing types, occupancy levels and general variation of climate, made it difficult to accurately predict annual residential wood consumption within the scope and limitations of this study.

9.3.4 Wind Resources

As can be expected very little information is available for wind resources in northern Saskatchewan. In order to fully assess the potential for wind generated electricity at any particular site, it is necessary to know the portion of the time that wind speeds exceed certain critical levels. This information can then be used to construct a wind velocity-duration curve, to calculate the annual energy output for a particular wind energy conversion system. Unfortunately, no historical wind data is available for any of the communities. A monitoring station has been established at Wollaston and a similar station may be installed at Southend in the near future.

As explained in the individual community assessments, wind potential can be expected to be fairly low in most northern Saskatchewan communities due to a high frequency of "calm" periods during the winter months.

9.3.5 Peat Resources

While significant peat resources exist throughout northern Saskatchewan, this report has only detailed reserves existing near Deschanbault Lake, Pinehouse and Dillon. Reserves north of the precambrian shield, while are known to exist, have not as yet been documented. Additionally, known fuel peat bogs have been identified in the vicinity of Dillon, Michel Village, St. George's Hill and Patuanak, but were not documented due to their impending connection to the electrical fuel (and loss of remote community status).

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* Unies Ltd. Report Energy Profiles for Manitoba Remote Communities, prepared for Energy, Mines and Resources Canada, January 1983.

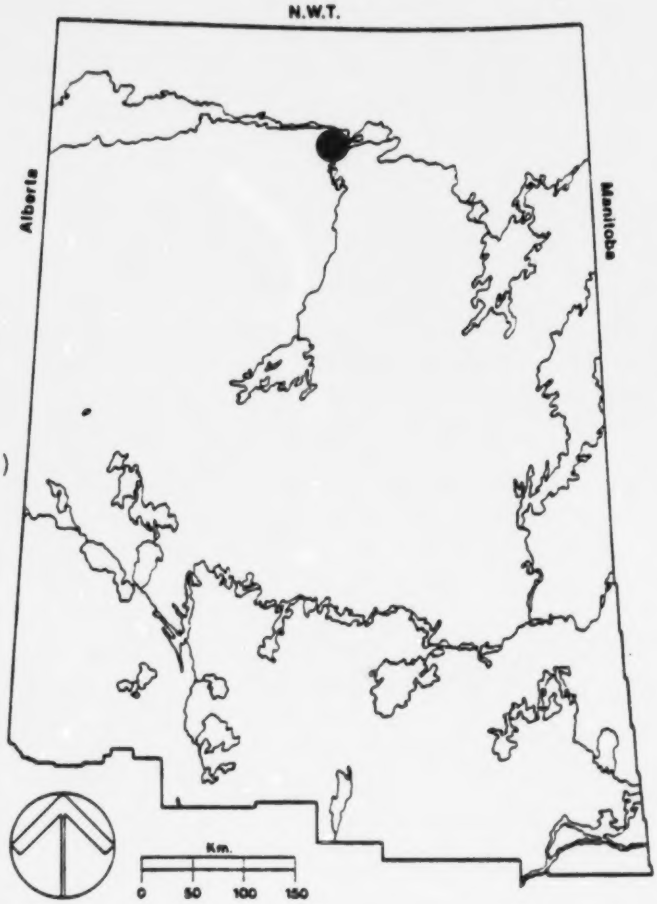
10. DATA BASE AND PROFILE OF REMOTE SASKATCHEWAN COMMUNITIES

COMMUNITY PROFILES

REMOTE COMMUNITY ANALYSIS

I. COMMUNITY PROFILE

BLACK LAKE



STATUS:

Reserve: Stony Rapids Band

Chipewyan Band Members located on I. R. 224. Total Reserves encompasses 26,150 ha (64,615 acres)

LOCATION:

Lat: 105° 36' W.

Long: 59° 08' N.

Located at the end of a 25 km road from Stony Rapids

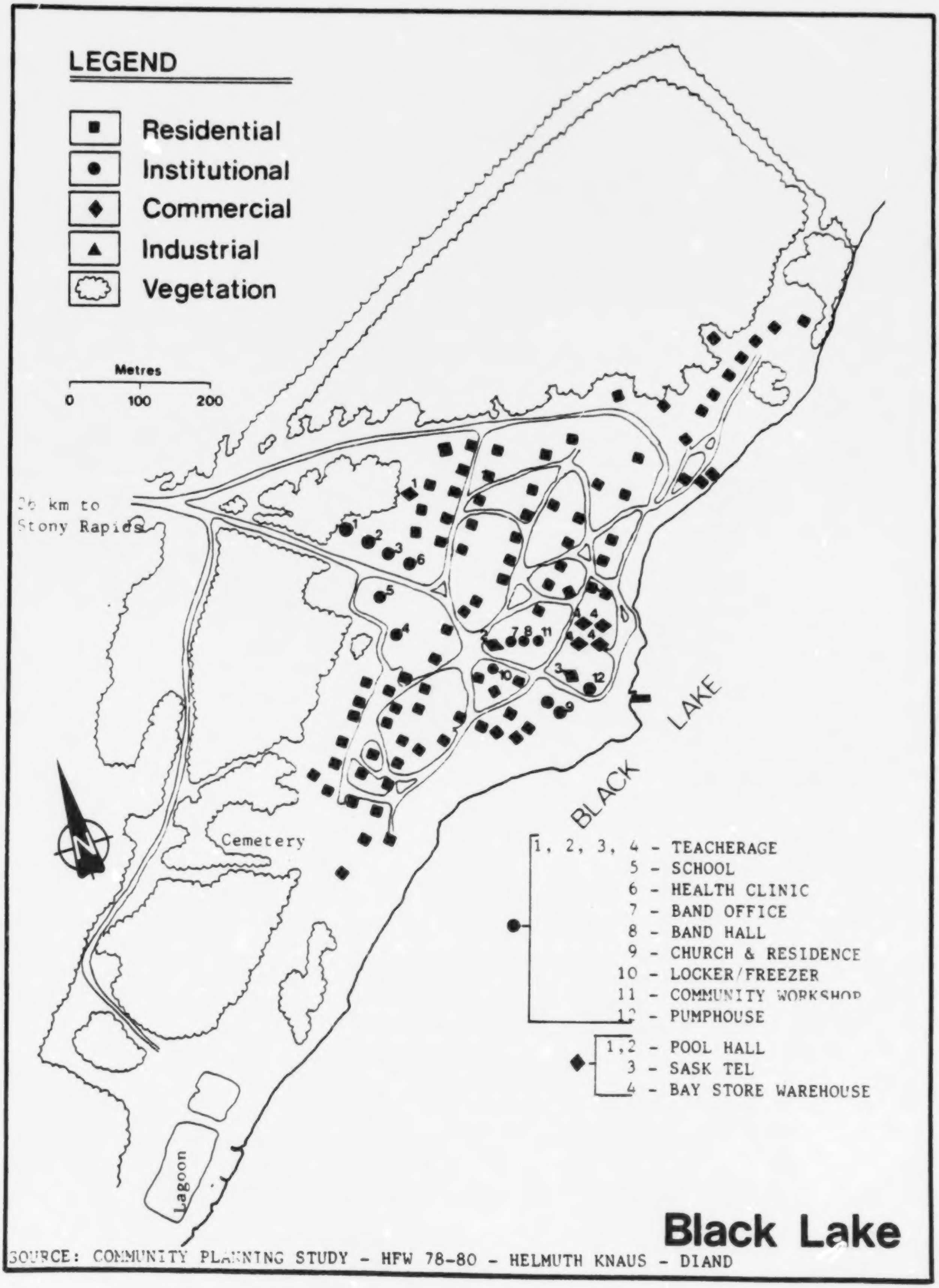
Source of Information:

Publications and Articles

Denosa, June 1981, p. 18-19.
Hilderman Feir Witty & Associates, Black Lake Community Planning Study, 1978-1980.
Institute of Northern Studies, Settlements of Northern Saskatchewan, University of Saskatchewan, 1973.
Institute of Northern Studies, The Chipewyan of the Stony Rapids Region, University of Saskatchewan, 1973.
Northern Saskatchewan Community Directory, August 1981, p. 3.
Saskatchewan Power Corporation "Memo: Energy Audit of School of Black Lake" Utilization and Conservation Section, November 1982.
Saskatchewan Power Corporation Northern Hydro Development: Economic Feasibility of Small Hydro Developments in the Black Lake Area.
S.P.C. Electric Supply Planning, September 1981.
Saskatchewan Power Corporation Woodcock Rapids Hydro Electric Project: Preliminary, P.F.R.A. Engineering Service, November 1979.

Interviews and Correspondence

Helmuth Knaus, Project Manager, D.I.A.N.D., Prince Albert, January 1983.
Richard Hankinson, District Planner, D.I.A.N.D., Prince Albert, January 1983.
Cal McLachlan, Manager, North-Sask Electric Ltd., La Ronge, January 1983.
Michael Weeks, Saskatchewan Power Corporation, Research and Development.
Brian Curran, Saskatchewan Power Corporation.
John Campbell, Stony Rapids, Gulf Bulk Fuel Station
Ed Elder, Manager, Hudson Bay Store, Black Lake.
Mr. Thomas, Federal Health Station, Black Lake.


LEGEND
■ Residential
● Institutional
◆ Commercial
▲ Industrial
Vegetation
Metres
0
100
200
26 km to Stony Rapids
1
2
3
4
5
6
7
8
9
10
11
12
Cemetery
Lagoon
BLACK LAKE
N
● 1, 2, 3, 4 - TEACHERAGE
5 - SCHOOL
6 - HEALTH CLINIC
7 - BAND OFFICE
8 - BAND HALL
9 - CHURCH & RESIDENCE
10 - LOCKER/FREEZER
11 - COMMUNITY WORKSHOP
12 - PUMPHOUSE
◆ 1,2 - POOL HALL
3 - SASK TEL
4 - BAY STORE WAREHOUSE

Black Lake

SOURCE: COMMUNITY PLANNING STUDY - HFW 78-80 - HELMUTH KNAUS - DIAND

A. HISTORY AND GROWTH

1. Community Established Starting in 1952, the Stony Rapids Band began moving from Stony Lake to the Black Lake settlement.
2. Demographics:

Present Population Approximately 720 persons (95% live at either Black Lake, Selwyn Lake, Stony Lake or Stony Rapids), 600 ± live at Black Lake.

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total)	533	547	564	578	595	614	634	658	682	692	720

Growth % Approximately 3% per year.

Projected Future Population Growth Steady at about 3-4% per year. Approximately 900+ by 1990.

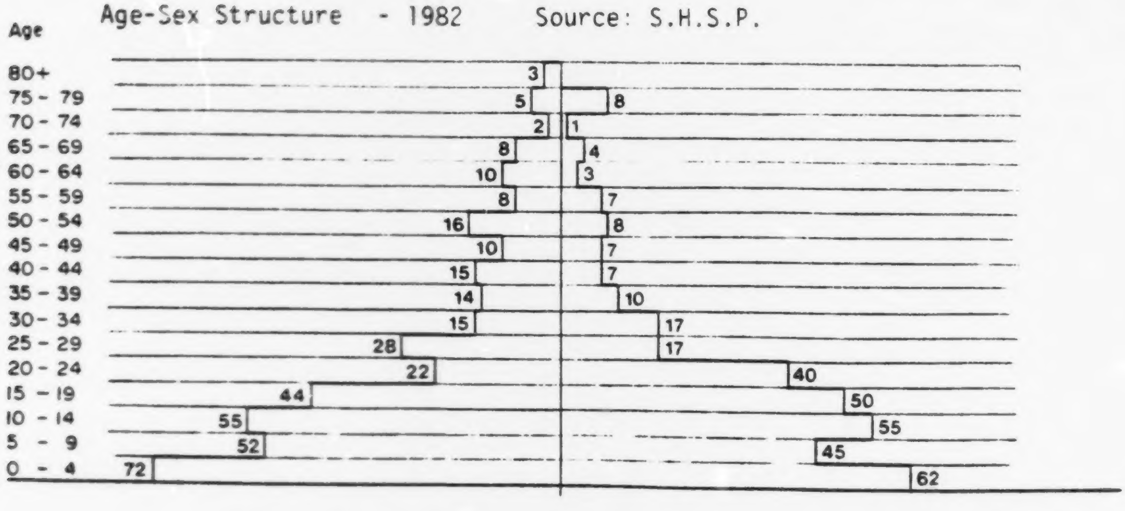
Ethnic Mix: White 15 persons (Bay, church, school, health office)

Metis ______ %

Indian 100 %

Other ______ % ______________________

Age-Sex Structure - 1982 Source: S.H.S.P.



No. of Males - 379 No. of Females - 341

B. Community Services

1. Water

Source		Distribution		Serving		Treatment	
Lake	X	Pipe to hydrants	X	Government Buildings	X	Sedimentation	
Stream		Truck		Commercial Buildings	X	Filtration	
Wells		Individual Systems	X	Residences		Chlorination	X
Other		To teacherage, school, health station, store, church, hall.		Standpipes	X	Flouridation	
						None	

2. Sewage

Collection System		Serving		Disposal	
Pipe	X	Government Buildings	X	Lagoon	X
Truck		Commercial Buildings	X	Septic Tanks	
Individual Systems	X	Residences		Treatment Plant	
None				None	

3. Solid Waste Disposal

Garbage Collection Organized X Yes ____ No (Intermittent)

Landfill Site Utilized X Yes ____ No

Other Methods of Disposal X Yes ____ No

4. Fire Protection Organized ____ Yes X No

Equipment Standpipes - fire truck in Stony Rapids.

5. Police Protection - R.C.M.P. X Yes ____ No

Patrolled from Stony Rapids detachment

C. Community Facilities

1. Health

Clinic in Community X yes ____ no

Size of Facility Hospital 195 m^2

Outpost Hospital X yes ____ no

Served By Uranium City

Staff 2 Doctors 1 Nurse (aide) Other

2. Education

School located in community X yes ____ no

Kindergarten - Grade 10 Size 1100 sq. m. Classrooms 9 plus library and mini-gym

Teacherages: Size 628 sq. m. (1/4-plex; 2/2-plex; 2/2 bedroom houses) 8 teachers, 3 teacher aides, 1 counsellor.

3. Residential

(1) Number of houses in community 98

(2) Number of houses with sewer and water 0 - 0%

(3) Number of houses with power hook-up 98 - 100%

(4) Housing condition: Good 37 - 38%

Fair 29 - 30% Poor 32 - 32%

(5) Number of houses constructed annually 7-8 size 7.3m(24') x 9.7m(32')

(6) Heat Source 100% jackpine, C-31 Valley Comfort heaters.

(7) Cooking 45% wood; 5% propane; 50% electric.

(8) Housing construction notes: 1982, size 7.3m x 9.7m; walls - 2 x 6 - R20; ceilings - R40; floors - R20.

Costs: $17,500 materials; $8,000 labour; $2,000 electrical; $7,500 transportation.

Source: Housing Survey - R. Hankinson, D.I.A.N.D., December, 1982. Prince Albert District Office. Estimates - Helmuth Knaus, D.I.A.N.D., Prince Albert District Office.

4. Community Buildings

	Type/Use	Size		Type/Use	Size
1.	Warehouse	53.5m^2	4.	Band Office	89.2m^2
2.	Community Bldg	784.5m^2	5.	Pumphouse	10.4m^2
3.	Walk-in Freezer	31.2m^2	6.	Standpipes	6.8m^2

5. Other Institutional/Commercial/Industrial Facilities (private, etc.)

	Type/Use	Size		Type/Use	Size
1.	Church (Rom. Cath.)	372 m^2	5.	Bay Store	743 m^2
2.	Priests Residence	93 m^2	6.	Bay Residence	74 m^2
3.	Pool Hall (Simon Robillard)	111 m^2	7.	Bay Warehouse	743 m^2
4.	Pool Hall (Jimmy Sayazic)	72 m^2	8.	Sask Tel	9.4 m^2

D. Economic Activities

Agriculture ____ Hunting X Trapping X

Fishing X Mining (employer) Cluff Lake

Forestry ____ Tourism (employer) Morbergs Camps
Camp Grayling

Other ____

E. Communications Links

(1) Post Office X yes ____ no Serviced 2 times per week.

Television X yes ____ no source & no. of stations -CBC North

Radio X yes ____ no source & no. of stations -CBH 93.3 F.M.

Telephone X yes ____ no

X individual X community

____ local ____ long distance

High Frequency Radio ____ yes ____ no (information unknown)

operated by ____

F. Transportation Links

1. Access to Community by Scheduled Services

	Carrier	Frequency	Origin
Air	Norcanair	2 times week to Stony	Southern Sask.
Truck	Hansons/others	as required	Stony Rapids
Bus	no		
Other	Taxi	as required	Stony Rapids

2. Local Transportation for Visitors

Taxi _X_ yes ____ no

Rental Vehicles ____ yes _X_ no - available in Stony sometimes

Charter Aircraft ____ yes _X_ no where/whom -available in La Ronge

3. Local Transportation - by Community

	Yes	No	Type
Boats	X		
Snowmobiles	X		
Cars	X		
Heavy Vehicles	X		1 Band truck for garbage pickup
Other			a Back Hoe

22.5 km of road on Reserve.
Gasoline purchased from either Ben Siemans (Gulf Bulk Oil Sales) or Lloyd Wells in Stony Rapids.
Lubricants from Bay in Black Lake.

Notes: Regarding historical growth of community
Social composition and decision-making
Past and future socio-economic trends

- Community solidly based at Black Lake - recently a land entitlement settlement (May 27/81) of 12,745 ha (31,480 acres) was awarded to the Band. Mineral rights belong to the Band and SMDC has negotiated rights of exploration on Reserve lands.

- All decisions in the community are made by the chief, 5 council members and the Band administrator.
- From approximately 1960 until 1981, North-Sask Electric operated diesel generators in the community. Now electric service is provided by North-Sask Electric from Stony Rapids.
- The community of Black Lake is quite dependent upon the transportation links (barge and air) to Stony Rapids. If barge service is discontinued, sources of oil as well as building materials will be severely affected.
- The Fond du Lac River, adjacent to Black Lake, was the source of a favourable study for small scale hydro generation in 1980 by North-Sask Electric.

H.1
Diesel Electric Generation

1. Location: BLACK LAKE [1]
2. Owner: North-Sask Electric
3. Diesel Type: 1981 - 3-250 KW
   1982 - all electricity generated in Stony Rapids
4.

Customers 1981	Number	1981 Consumption (kwh)
Residential	90	403,496
Commercial	5	106,813
Government	9	163,343
Street Lights	1	16,455
Total	105	690,344

Average Residential Consumption 376.6 kWh/Mo (1981)

Diesel Fuel:

	1981	1982	1983
Cost $	0.3150	0.3689	-
Annual Fuel Use Litres	285,593	163,650[2]	-
KWh/litre fuel	2.4	-	-
Fuel cost increases over previous year (%)	+8.56	-	-

Fuel Storage Capacity

Peak Load

Forecast Peak Loads:

1981 145 kW; 1982 165 kW; 1983 210 kW;

1984 310 kW; 1985 380 kW

Notes:

[1] Source: North Sask Electric

[2] SPC estimate; represents approximately 6 months before switchover to Stony Rapids power generation.

H.2 ENERGY PROFILE - ANNUAL CONSUMPTION - BLACK LAKE

Classification	Annual Energy Consumption			
	Electricity (MWH)	Fuel Oil $(x\ 10^3)^L$	Propane $(x\ 10^2)^L$	Wood (Cords)
Education	58	76	55	--
Health	20	12	--	--
Protection	--	--	--	--
Communications	140	--	--	--
Transport Services	--	--	--	--
Government	--	--	--	--
Community Services	84	43	--	--
Commercial	70	82	--	15
Residential	404	--	44	780
Total	776	213	99	795

H.3 ENERGY PROFILE - SOURCE FUEL CONSUMPTION

Classification	Annual Source Fuel Consumption - Basis 1982 Facilities				
	Electricity[1] (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	935	2,941	150	--	4,026
Health	323	464	--	--	787
Protection	--	--	--	--	--
Communications	2,258	--	--	--	2,258
Transport Services	--	--	--	--	--
Other Government	--	--	--	--	--
Community Services	1,355	1,664	--	--	3,019
Commercial	1,129	3,173	--	246	4,548
Residential	6,515	--	120	12,792	19,427
Total	12,515	8,242	270	13,038	34,065

1. Lists the consumption of Source Fuel (usually fuel oil) required to generate electrical energy, and uses an average performance index of 2.4 kwh/litre of fuel.

I. RESOURCE ASSESSMENTS

1.0 POTENTIAL SMALL SCALE HYDRO ELECTRIC SITES: BLACK LAKE

1.1 Background

There are a number of potential hydro-electric sites within close proximity to the community of Black Lake. Given the electrical generation potential of each of these sites and the proximity of Stony Rapids (an electrical transmission line already connects the two communities), it is very likely that a hydro-electric facility could serve both communities. In most of the sites mentioned, significant additional generating capacity may be available to provide the community on Fond du Lac with electrical power (requiring the construction of a 80-100 km transmission line).

The following site evaluations are based primarily on preliminary assessments conducted by S.P.C. In all cases further detailed feasibility studies are required. While the scope of this study is limited to sites within 16 km, some promising sites have been identified beyond this limit.

1.2 Sites Within 16 km Radius

Elizabeth Falls - Located on the Fond du Lac River between Black Lake and Middle Lake, this site, 4 km from the community of Black Lake, has significant hydro electric potential. Over a 5 km distance, the river falls an estimated 33.5 m. The minimum unregulated flow of the river has been estimated at 127 m^3/s. As a result, approximately 36 MW of electrical generation capacity could be installed (assuming 80% generating efficiency). If upstream regulation of the water level in Black Lake is utilized within its natural water level variation of 1 m, a minimum flow of 180 m^3/s could be obtained. As a result, 51 MW of capacity would be available.

This site provides potential far beyond even the long term requirements of the local communities. In addition, Elizabeth Falls is considered a significant natural feature and tourism resource of the north. Initial investigations indicate that the area may also be of substantial archaeological significance. As a result, development of this site over the year term is unlikely.

Woodcock Rapids - This is a set of rapids located at the 4 km mark of the Fond du Lac River, between Middle Lake and Fond du Lac (the lake). The river level drops approximately 27 m over this 1.6 km stretch. The minimum river flow is approximately 127 m^3/s. Therefore, there potentially exists a firm generating capacity of 28 MW over the entire length of the rapids.

The Saskatchewan Power Corporation has conducted a preliminary assessment of a small hydro plant located at one of the rapids.* Considered in the report, was the initial installation of a 500 kw generator with provisions made for an additional 50 kw generating capacity. The project, at the preliminary planning stage, appeared to have minimal effect on the surrounding landscape and existing watercourse.

1.3 Potential Sites Beyond a 16 km Radius

Burr Falls - This site is located approximately 48 km east of the community of Black Lake on the Fond du Lac River, about 5 km upstream from Black Lake. At this location, there is a firm river flow of 70 m^3/s and a head potential of 16-22 m. Initial evaluation indicates that this site would provide up to 10 MW of generating capacity.

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* Saskatchewan Power Corporation Engineering Report Woodcock Rapids Hydroelectric Project, Preliminary, November 1979.

Chipman River - This river, fed from a drainage basin of approximately 5580 km^2, flows into Black Lake from the north. The mouth of the river is roughly 25 km northeast of the Black Lake settlement. Along the lower reaches, the river drops into a narrow gorge, falling close to 112 m. Selwyn Lake, located north of the gorge, may also have potential for water storage, which would increase the minimum flow and hence the generating capacity of the river. From the limited records available, a minimum daily discharge of 5.7 m^3/s flows from the Chipman into Black Lake. S.P.C. has estimated that a firm generating capacity of 5 MW can be established. If additional water regulation is added, utilizing Selwyn Lake, a generating capacity of 12 MW may be available.

2.0 WOOD RESOURCES

Very little detailed data is available on the forest resources around the community of Black Lake. The area to the northwest of the community, and south across to the lake is an extensive fireburn. Most of the burn area directly surrounding the community has already been picked over. As a result, a number of residents travel across Black Lake to the south shore to harvest standing firekill wood.

The burn area surrounding the community stretches west from the Stony Rapids/Black Lake Road. The area east of the road is mature forest, untouched by the forest fires that occurred in the area, some ten years ago. Partially burned or scarred and standing jackpine is the major wood available in the burn areas. Some green wood is also harvested in the forests to the north of the community.

Discussions with various authorities indicate that there is plenty of wood available around the community to satisfy household heating requirements over the long term. Further study would be required to determine if wood is available in sufficient quantities to sustain an additional large scale wood consumer, such as a steam or wood gassification power generating plant.

3.0 WIND RESOURCES

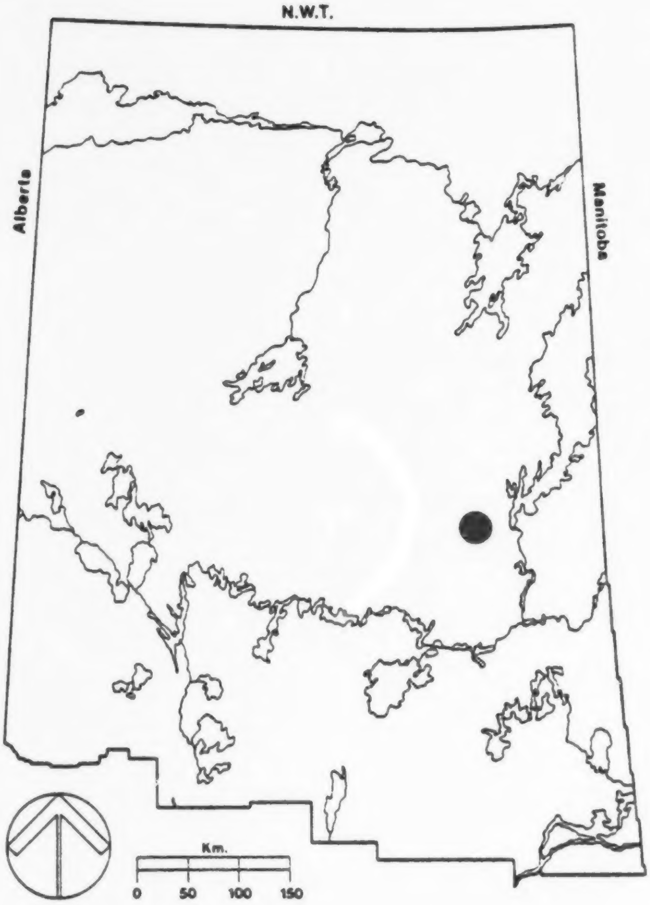
Very little data is available on the wind characteristics of this location. General observations of global wind patterns indicate that during the winter months, the westerly flow of winds shift south, subjecting the northern areas of Saskatchewan to frequent periods of calm. Further investigation of the microclimatic factors surrounding the community (including significant topographical features), would be required to establish the potential for wind at this site. The closest weather-station that is able to monitor wind characteristics is at Uranium City. A wind monitoring station has also recently been created at Wollaston.

Brabant Lake

REMOTE COMMUNITY ANALYSIS

I. COMMUNITY PROFILE

BRABANT LAKE



STATUS:

Local Advisory Council

L.A.C.

LOCATION:

Lat: $56^{0}07'$,

Long: $103^{0}44'$

Source of Information:

Publications and Articles

Northern Saskatchewan Community Directory, August 1981, p. 4.

Interviews and Correspondence

Nicki Brandon - Community Planner - DNS - Prince Albert, January 1983.

Cal McLachlan - Manager North-Sask Electric Ltd., La Ronge, January 1983.

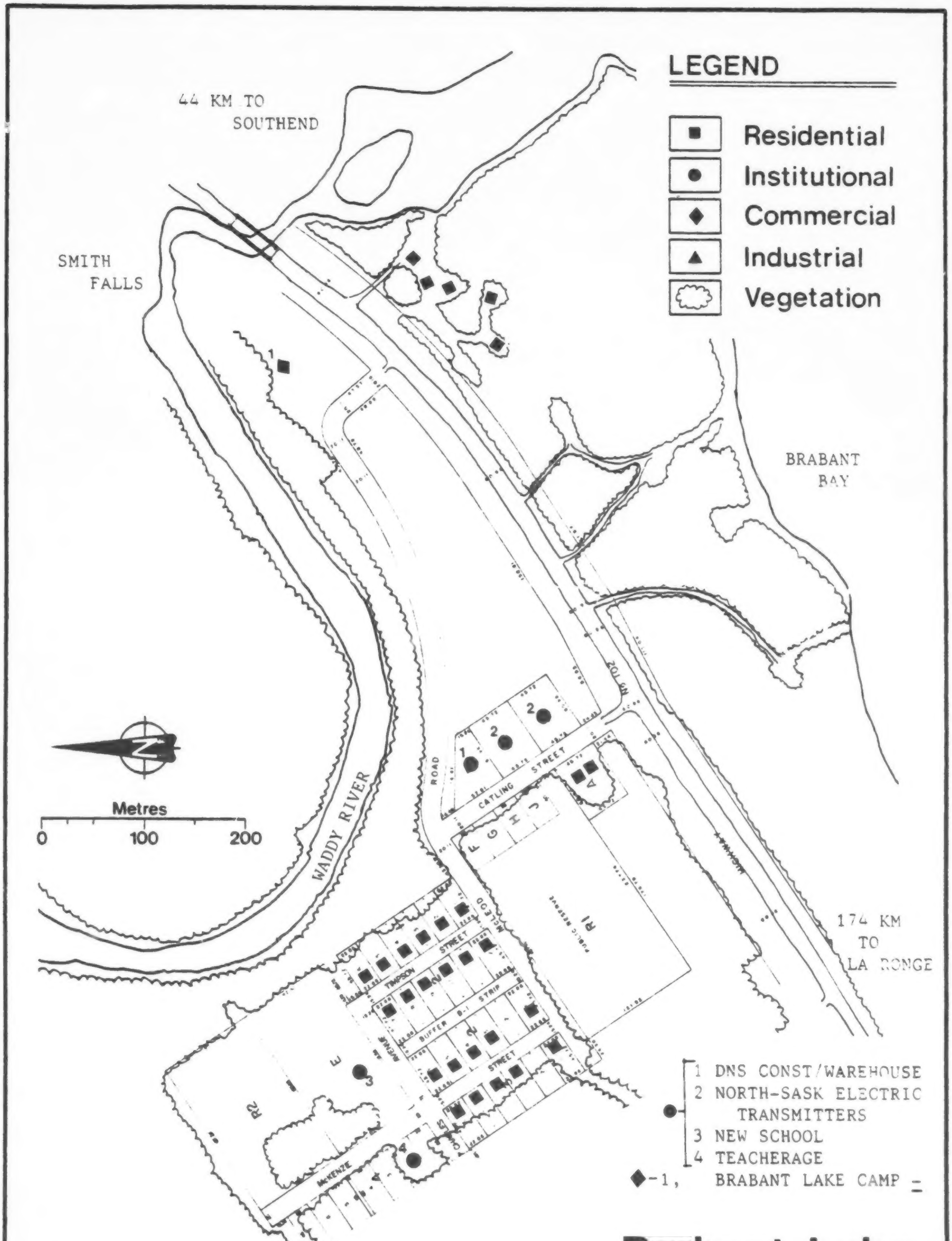
Brian Ritchie - Capital Co-ordinator - Northern Lights School Division, Prince Albert, January 1983.

Larry Evans - Manager - Sask Housing Corporation, Northern Division, January 1983.

Resource Officer, Southend/Reindeer, February 1983.

H. Ulrickson, Gulf Fuel Dealer - Southend, February 1983.

Harold Brunning, La Ronge Propane, La Ronge, February 1983.


LEGEND
■ Residential
● Institutional
◆ Commercial
▲ Industrial
Vegetation
44 KM TO SOUTHEND
SMITH FALLS
BRABANT BAY
174 KM TO LA RONGE
WADDY RIVER
Metres
0
100
200
N
ROAD
CATLING STREET
TIMPSON STREET
BUFFER STRIP
STREET
McLEOD
McKENZIE
AVENUE
HIGHWAY 102
R1
R2
A
E
F
G
H
J
1
2
3
4
1 DNS CONST/WAREHOUSE
2 NORTH-SASK ELECTRIC TRANSMITTERS
3 NEW SCHOOL
4 TEACHERAGE
◆-1, BRABANT LAKE CAMP

Brabant Lake

SOURCE: 1:5000/1981 AIR PHOTOS - DNS COMMUNITY PLANNING PLANS & FIELD NOTES 79-80.

A. HISTORY AND GROWTH

1. Community Established In 1975 DNS began constructing houses at Brabant Lake.

2. Demographics:

Present Population Most recent survey - Municipal Census, April 1980 - 129 persons.

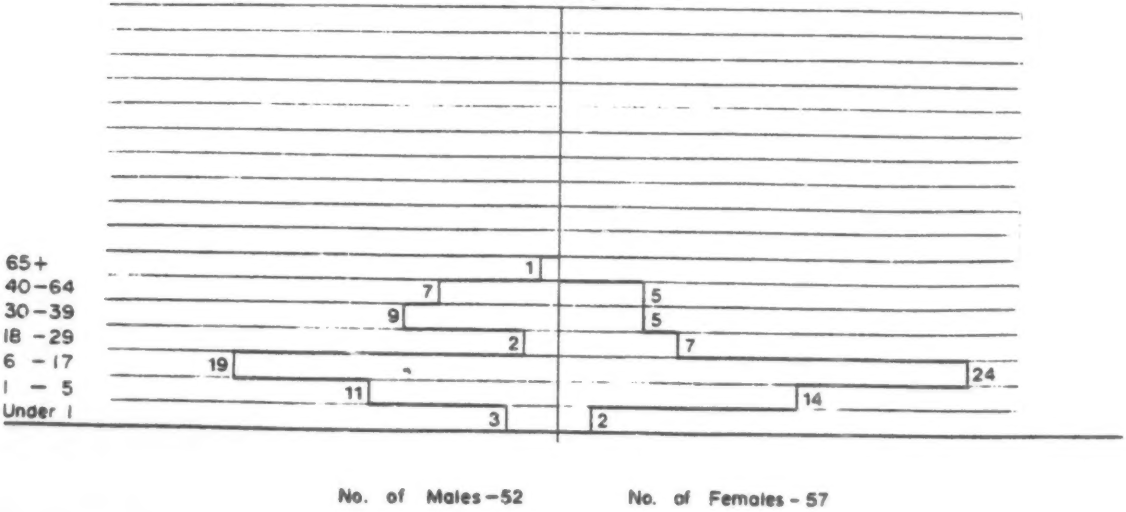
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total)						109			129		

Growth % 2 - 3%/year

Projected Future Population Growth Noted that due to the transient nature of the population, it varies dramatically.

Ethnic Mix: White ____% } 19%
Metis ____% }
Treaty Indian (Cree) 81 %
Other ____%

Age-Sex Structure/Source: Saskatchewan Indian Community Environment Profiles, 1977.



B. Community Services

1. Water

Source		Distribution		Serving		Treatment	
Lake	X	Pipe		Government Buildings	X	Sedimentation	X
Stream		Truck		Commercial Buildings		Filtration	X
Wells		Individual Systems	X	Residences		Chlorination	X
Other		None		Standpipes		Flouridation	
						None	

2. Sewage

Collection System		Serving		Disposal	
Pipe	X	Government Buildings	X	Lagoon	X
Truck		Commercial Buildings		Septic Tanks	X
Individual Systems	X	Residences		Treatment Plant	
None				None	

3. Solid Waste Disposal

Garbage Collection Organized	X	Yes		No
Landfill Site Utilized	X	Yes		No
Other Methods of Disposal		Yes		No

4. Fire Protection Organized

Fire Protection Organized		Yes	X	No

Equipment

5. Police Protection - R.C.M.P.

Police Protection - R.C.M.P.	X	Yes		No

Patrolled from La Ronge detachment

C. Community Facilities

1. Health

Clinic in Community ____ yes X no

Size of Facility Hospital Not applicable

Outpost Hospital ____ yes X no

Served By Southend Health Centre, La Ronge

Staff ____ Doctors 1 Nurse ____ Other

Visits once or twice a month.

2. Education

School located in community X yes (1979) no

Kindergarten - Grade 9 Size 706 sq. m. Classrooms 3 (plus Activi Rm., Home E Shop)

Teacherages: Size ____ sq. m. 2 teachers, 1 teacher aide

3. Residential

(1) Number of houses in community 26

(2) Number of houses with sewer and water Teacherage only

(3) Number of houses with power hook-up 26/100%

(4) Housing condition: Good 43% less than 5 years old

Fair 57% 5-7 years old Poor ____

(5) Number of houses constructed annually 2-3 units Size $92.9m^2$-$102m^2$

(6) Heat Source wood/oil furnaces or oil furnaces, also space heaters

(7) Cooking wood

(8) Housing construction notes: Since 1973 houses built with basement to CMHC standards. R24 walls, R40 ceilings, prior to 1973 houses were 2, 3, 4 bedroom 800-900 sq. ft. Now to standard plans 1000-1100 sq. ft. Cost $60,000.

Source: Larry Evans, Sask Housing Northern Division.

4. Community Buildings

Type/Use	Size	Type/Use	Size
1. DNS Const/Warehouse	127.7m^2	4.	
(DTRR Generator Plant) 2. North-Sask Electric	10.2m^2	5.	
3. DNS Radio Office	40m^2	6.	

5. Other Institutional/Commercial/Industrial Facilities (private, etc.)

Type/Use	Size	Type/Use	Size
1. Brabant Lake Camp	N/A	4.	
2. Store/cabins/cafe		5.	
3.		6.	

D. Economic Activities

Agriculture		Hunting	X	Trapping	X
Fishing	X	Mining		Transportation	
Forestry		Tourism, Guiding	X	Service Centre Brabant Lake Camp	X

Other Prov. & Private

E. Communications and Transportation Links

(1) Post Office ___ yes X no serviced from La Ronge

Television X yes ___ no source & no. of stations

Radio X yes ___ no source & no. of stations - CKBI Prince Albert, CBC 91.7 F.M.

Telephone X yes ___ no

X individual ___ community

X local X long distance

High Frequency Radio X yes ___ no

operated by ___

F. Transportation Links

1. Access to Community by Scheduled Services

	Carrier	Frequency	Origin
Air	chartered float plane or skis	as required	La Ronge
Truck	any	as required	
Bus	any	twice/week	
Other			

Proximity to Highway 102 ensures ready access to services from south.

2. Local Transportation for Visitors

Taxi _____ yes _____ no

Rental Vehicles _____ yes _____ no

Charter Aircraft _____ yes _____ no _____ where/whom

Information not available

3. Local Transportation - by Community

	Yes	No	Type
Boats	X		
Snowmobiles	X		
Cars	X		
Heavy Vehicles			1/2 ton truck for garbage pick up
Other			

G. Notes: Regarding historical growth of community.
Social composition and decision-making.
Past and future socio-economic trends.

- traditional radio-communication centre,
- recognized only as a settlement with a few scattered households when first survey plan was established,
- under proposed Northern Municipalities Act, Brabant Lake will become incorporated as a northern Hamlet.

H.1
Diesel Electric Generation

1. **Location:** BRABANT LAKE[1]
2. **Owner:** North Sask Electric
3. **Diesel Type:** 1-100 KW; 1-75 KW

4.

Customers 1981	Number	1981 Consumption (KWH)
Residential	18	95,686
Commercial	1	34,793
Government	7	96,210
Street Lights	1	2,224
Total	27	228,913

Average Residential Consumption 442.9 kWh/Mo (1981)

Diesel Fuel:

	1981	1982	1983
Cost $	.273	.2912	.2542
Annual Fuel Use Litres	112,270	123,490[2]	135,840[2]
KWh/litre fuel	2.04	-	-
Fuel cost increases over previous year (%)	+48.2	+6.7	-12.7

Fuel Storage Capacity 2 x 22,730 = 45,460 litres

Peak Load 45 KW

Forecast Peak Loads:

1981 72 kW; 1982 80 kW; 1983 88 kW;
1984 95 kW; 1985 110 kW

Notes:

[1] Source: North Sask Electric

[2] Estimate based on 10% fuel usage increase p.a.

H.2 ENERGY PROFILE - ANNUAL CONSUMPTION - BRABANT LAKE

Classification	Annual Energy Consumption Electricity (MWH)	Fuel Oil $(x\ 10^3)^L$	Propane $(x\ 10^2)^L$	Wood (Cords)
Education	66	37	40	--
Health	--	--	--	--
Protection	--	--	--	--
Communications	26	--	--	--
Transport Services	--	--	--	--
Government	2	1	--	--
Community Services	2	--	--	--
Commercial	34	--	--	20
Residential	96	2	4	175
Total	226	40	44	195

H.3 ENERGY PROFILE - SOURCE FUEL CONSUMPTION

Classification	Annual Source Fuel Consumption - Basis 1982 Facilities				
	Electricity[1] (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	1,252	1,432	109	--	2,793
Health	--	--	--	--	--
Protection	--	--	--	--	--
Communications	493	--	--	--	493
Transport Services	--	--	--	--	--
Other Government	38	39	--	--	77
Community Services	38	--	--	--	38
Commercial	645	--	--	328	973
Residential	1,821	77	11	2,870	4,779
Total	4,287	1,548	120	3,198	9,153

1. Lists the consumption of Source Fuel (usually fuel oil) required to generate electrical energy, and uses an average performance index of 2.04 kwh/litre of fuel.

I. RESOURCE ASSESSMENTS

1.0 POTENTIAL SMALL SCALE HYDRO ELECTRIC SITES - BRABANT LAKE

1.1 Background

To date, there has been no formal investigation of small scale hydro electric potential in the vicinity of Brabant Lake. Very preliminary evaluation of topographical and hydrological features within a 16 km radius indicates that there are a number of sites worthy of further investigation. This would include the installation of a water gauge station (to determine minimum flow rates) and site inspection.

1.2 Sites Within a 16 km Radius

Waddy River - Located just north of the settlement of Brabant Lake, the Waddy River drops a total of 29 m over the 7 km from Lower Waddy Lake to Brabant Bay. Given that adequate minimum waterflows exist, a small generating facility may be feasible. Further investigation is recommended.

Chartier River - Located to the southwest of the Brabant Lake settlement, the Chartier River drops approximately 30 m over the 12 km between Wierzycki Lake and Brabant Lake. As illustrated on the 16 km radius topographical map, a series of rapids occur in a relatively narrow gorge or steep sided valley. Stream flow data is unavailable for this site and further investigation is recommended.

2.0 WOOD RESOURCES

Investigations by Saskatchewan Power Corporation have indicated that wood reserves within a 19 km radius of Brabant Lake are 738,851 cords. Approximately 17% of this area is made up of hardwoods, predominantly aspen. The major softwood species available are black spruce and jackpine. Small amounts of white spruce and birch are also scattered throughout the area. The settlement lies in the centre of an old burn. About 75% of the softwoods in the area fall within the 10 cm to 18 cm diameter size class (too small for commercial harvest) and 65% of the hardwoods also fall within this class.

In terms of total biomass available within a 19 km radius, Saskatchewan Power Corporation has estimated the following additional volumes are available when considering tops and foliage.

Foliage:	59,000 - 118,000 cords
Tops:	44,000 - 96,000 cords

Based on the above information, Saskatchewan Power Corporation has concluded that more than adequate wood resources exist in the area surrounding Brabant Lake to sustain local consumption and a wood gasification electrical generation plant for the community over the next 50 years.

3.0 WIND RESOURCES

Very little data is available on the wind characteristics of this location. General observations of global wind patterns indicate that during the winter months, the westerly flow of winds shift south, subjecting the northern areas of Saskatchewan to frequent periods of calm. Further investigation of the microclimatic factors surrounding the community (including significant topographical features), would be required to establish the potential for wind at this site. The closest weather station presently monitoring wind characteristics is located at La Ronge.

Camsell Portage

REMOTE COMMUNITY ANALYSIS

I. COMMUNITY PROFILE

CAMSELL PORTAGE

STATUS:

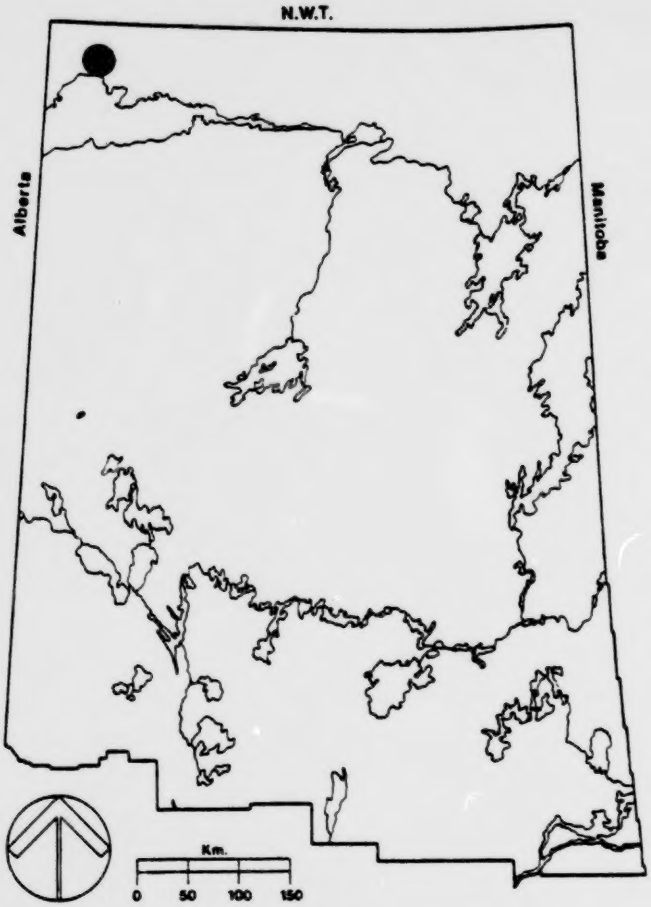
Local Advisory Council

L.A.C.

LOCATION:

Lat: 59°37'

Long: 109°15'



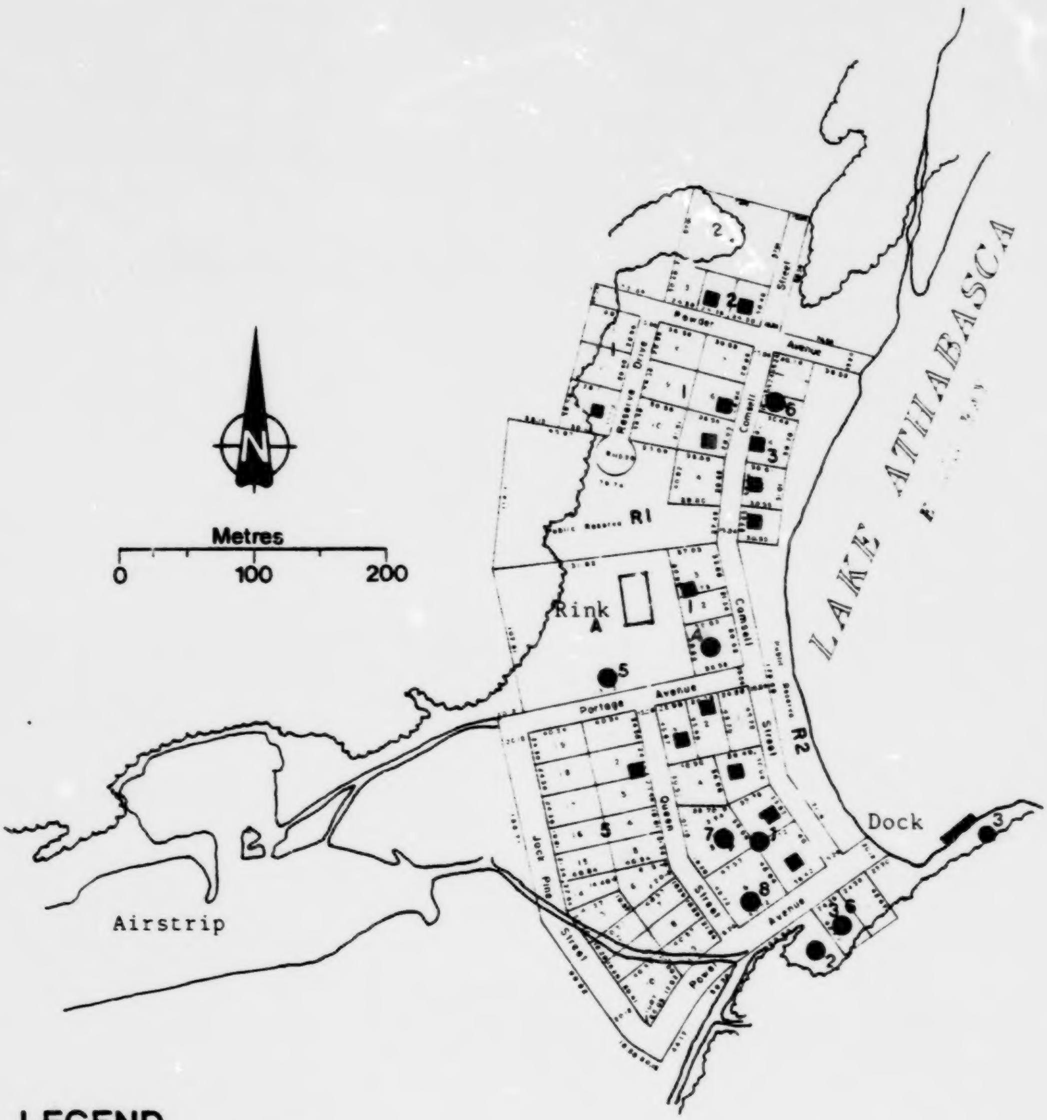
Source of Information:

Publications and Articles

Institute of Northern Studies, Settlements of Northern Sask., University of Saskatchewan, 1973.
Denosa, "Air rate increase hits residents of remote Camsell Portage, summer/fall 1979, p. 30-31.
Denosa, Gardens flourish in Camsell's sandy soil, October 1981, p. 20.
Northern Saskatchewan Community Directory, August 1981.

Interviews

Cal McLachlan, Manager North-Sask Electric, La Ronge, January 1983.
David Klippenstein, UMA, Athabasca Regional Services Study, January 1983.
Brian Ritchie, Capital Co-ordinator, Northern Lights School Division, Prince Albert, January 1983.
Larry Evans, Manager, Sask Housing Corp., Northern Department, January 1983.
Al Tokar, Resident Camsell Portage, January 1983.
Imperial Oil, Uranium City, January 1983.



N
Metres
0
100
200
LAKE ATHABASCA
Dock
Airstrip
Rink
R1
R2
Powder Avenue
Portage Avenue
Camsell Street
Queen Street
Jack Pine Street
Reserve Drive
Public Reserve
1
2
3
4
5
6
7
8

LEGEND

■ Residential
● Institutional
◆ Commercial
▲ Industrial
☁ Vegetation

●
1 - PUMPHOUSE
2 - NORTH SASK ELECTRIC POWER PLANT
3 - STORAGE
4 - LOG CHURCH
5 - SCHOOL
6 - PUMPHOUSE
7 - OLD HUDSON BAY STORE
8 - DNS

Camsell Portage

SOURCE: 1:5000 AIR PHOTO'S 1981 DNS COMMUNITY PLANNING FIELD NOTES & LEGAL PLANS 1979

A. HISTORY AND GROWTH

1. Community Established Reached a peak in 1950, then declined with the establishment of Uranium City.
2. Demographics:

Present Population 61, 1980 Municipal Census.

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total) (no other information available)			65						61		

Growth % 3% growth - medium rate.

Projected Future Population Growth 1985 @ 3% growth - 70 1990 - 82, 1995 - 95. (Source: DNS Community Planning).

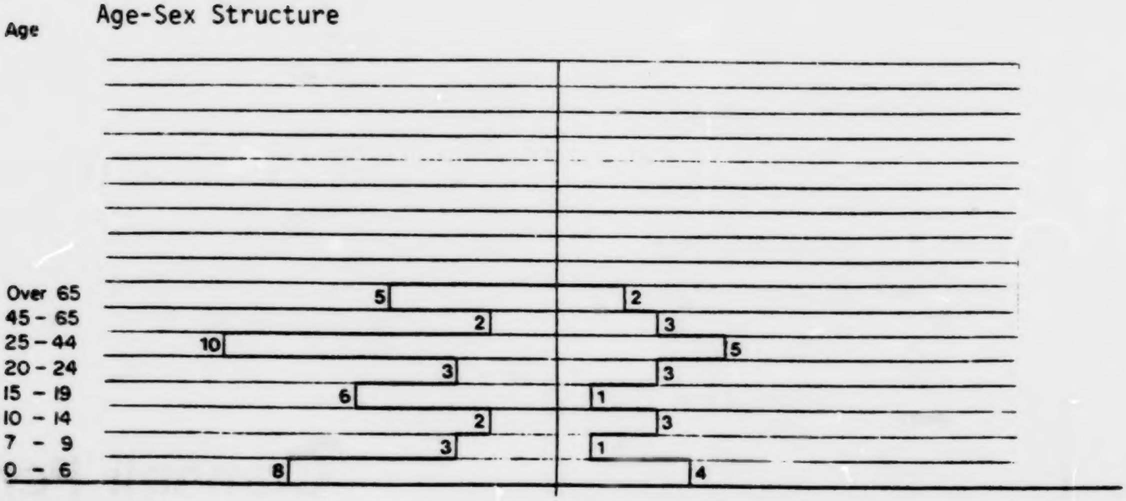
Ethnic Mix: White ____% } majority of residents are Metis

Metis ____% }

Indian ____%

Other ____% ________________

Age-Sex Structure



No. of Males - 39 No. of Females - 22

B. Community Services

1. Water

Source		Distribution		Serving		Treatment	
Lake	X	Pipe		Government Buildings	X	Sedimentation	
Stream		Truck		Commercial Buildings		Filtration	
Wells	X	Individual Systems	X	Residences		Chlorination	
Other		None		Standpipes	X	Flouridation	
						None	X

2. Sewage

Collection System		Serving		Disposal	
Pipe		Government Buildings	X	Lagoon	
Truck		Commercial Buildings		Septic Tanks	X
Individual Systems	X	Residences		Treatment Plant	
None				None	

3. Solid Waste Disposal

Garbage Collection Organized ____ Yes X No

Landfill Site Utilized ____ Yes X No

Other Methods of Disposal X Yes ____ No Incinerator

4. Fire Protection Organized ____ Yes X No

Equipment Bucket

5. Police Protection - R.C.M.P. X Yes ____ No

Patrolled from Uranium City

C. Community Facilities

1. Health

Clinic in Community ___ yes X no

Size of Facility Hospital Not applicable

Outpost Hospital X yes ___ no

Served By Uranium City - 37 km west by air.

Staff -- Doctors -- Nurse -- Other

DNS nurse visits monthly from Uranium City.

2. Education

School located in community X yes ___ no

Kindergarten - Grade 9 Size 185.8 sq. m. Classrooms 2

(built 197
& 1975 -
wood frame)

Teacherages: Size ___ sq. m. 1 teacher, 16 students (1980).

3. Residential

(1) Number of houses in community 18

(2) Number of houses with sewer and water 0-0%

(3) Number of houses with power hook-up 100%

(4) Housing condition: Good 33% (5 houses less than 5 years)

Fair 67% 5-10 years old Poor ___

(5) Number of houses constructed annually approx. 3 every 2-3 years

Size 90-100m^2

(6) Heat Source wood/oil furnaces

(7) Cooking propane

(8) Housing construction notes: DNS standard construction, basements CMHC standards, $60,000, R20 walls, R40 ceilings.

Source: Larry Evans, Sask Housing.

4. Community Buildings

	Type/Use	Size		Type/Use	Size
1.	Old Hudson Bay Store	Size unknown	4.	Log Church	$232m^2$
2.	Storage (Ice House)	Size unknown	5.	Pumphouse	$14m^2$
3.	Pumphouse	$14m^2$	6.	Sask Tel	$33m^2$

5. Other Institutional/Commercial/Industrial Facilities (private, etc.)

	Type/Use	Size		Type/Use	Size
1.	North-Sask Electric	Size unknown	3.	Pumphouse	$14m^2$
2.	Dept of Highways Storage Bunkhouse Workshop	$81.4m^2$	4.		
			5.		

D. Economic Activities

Agriculture		Hunting		Trapping	X
Fishing	X	Mining		Transportation	
Forestry		Tourism		Service Centre	

Other Linecutting/drilling co./Charlot River Hydro Project
Camsell Consumer Co-operative purchases heating oil.

E. Communications and Transportation Links

(1) Post Office ____ yes X no serviced from Uranium City (3 days)

Television X yes ____ no source & no. of stations

Radio X yes ____ no source & no. of stations - CBDH 105.1 F.M.

Telephone X yes ____ no

X individual ____ community

X local X long distance

High Frequency Radio ____ yes ____ no

operated by ____________

F. Transportation Links

1. Access to Community by Scheduled Services

	Carrier	Frequency	Origin
Air	charter-gravel airstrip-760m	as required	Uranium City
Truck	no road access	--	
Bus	--	--	
Other	--	--	

2. Local Transportation for Visitors

Taxi _____ yes __X__ no _____

Rental Vehicles _____ yes __X__ no

Charter Aircraft _____ yes __X__ no where/whom - Uranium City

3. Local Transportation - by Community

	Yes	No	Type
Boats	X		
Snowmobiles	X		
Cars		X	
Heavy Vehicles	X		grader
Other		X	

G. Notes: Regarding historical growth of community.
Social composition and decision-making.
Past and future socio-economic trends.

No store at Camsell Portage: all shopping done at Uranium City. Everyone has at least one or more deep freezes. Major travel by snowmobile and boat. This community is totally dependent upon Uranium City for services. The Camsell Consumer Co-operative purchases heating oil which is stored in 10,000 gallon tanks.

Under the proposed Act, Camsell will become a settlement - not incorporated as the population assessment is not sufficient for it to become a northern hamlet.

H.1

Diesel Electric Generation

1. Location: CAMSELL PORTAGE [1]

2. Owner: North Sask Electric

3. Diesel Type: 75 KW, 50 KW

4.

Customers 1981	Number	1981 Consumption (KWH)
Residential	14	66,304
Commercial	1	126
Government	6	52,835
Street Lights	2	7,557
Total	23	126,822

Average Residential Consumption 394.7 kWh/Mo (1981)

Diesel Fuel:

	1981	1982	1983
Cost $	0.238	0.3403	0.3722
Annual Fuel Use Litres	69,010	75,910[2]	83,500[2]
KWh/litre fuel	1.84		-
Fuel cost increases over previous year (%)	-4.03	+43	+9.3

Fuel Storage Capacity 113,650

Peak Load 40 - 45KW

Forecast Peak Loads:

1981 45 kW; 1982 55 kW; 1983 62 kW;

1984 70 kW; 1985 80 kW

Notes:

[1] Source: North-Sask Electric

[2] Estimate based on 10% fuel usage increase p.a.

H.2 ENERGY PROFILE - ANNUAL CONSUMPTION - CAMSELL PORTAGE

	Annual Energy Consumption			
Classification	Electricity (MWH)	Fuel Oil $(x\ 10^3)^L$	Propane $(x\ 10^2)^L$	Wood (Cords)
Education	25	15	11	--
Health	--	--	--	--
Protection	--	--	--	--
Communications	68	--	--	--
Transport Services	--	--	--	--
Government	20	4	--	--
Community Services	45	9	--	10
Commercial	1	--	--	--
Residential	633	18	150	95
Total	792	46	161	105

H.3 ENERGY PROFILE - SOURCE FUEL CONSUMPTION

Classification	Annual Source Fuel Consumption - Basis 1982 Facilities				
	Electricity[1] (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	526	581	30	--	1,137
Health	--	--	--	--	--
Protection	--	--	--	--	--
Communications	1,430	--	--	--	1,430
Transport Services	--	--	--	--	--
Other Government	421	155	--	--	576
Community Services	946	348	--	164	1,458
Commercial	21	--	--	--	21
Residential	13,314	697	408	1,558	15,977
Total	16,658	1,781	438	1,722	20,599

1. Lists the consumption of source fuel (usually fuel oil) required to generate electrical energy, and uses an average performance index of 1.84 kwh/litre of fuel.

1. RESOURCE ASSESSMENT

1.0 POTENTIAL SMALL SCALE HYDRO ELECTRIC SITES: CAMSELL PORTAGE

1.1 Background

The area around Camsell Portage is generally considered to be one of the best sites for large scale hydro electric development located within the Province of Saskatchewan. From Tazin Lake, south 25 km to Camsell Portage, located on the shore of Lake Athabasca, there is a drop of 131 m.

There are presently three hydro electric stations, originally designed to service Uranium City, in relatively close proximity to Camsell Portage. One of these stations is located approximately 14 km from the settlement, at the White Lake Dam on the Charlot River. Some areas offering small hydro potential do exist on the lower reaches of the Charlot, below the White Lake Dam. However, given the proximity of the existing station to Camsell, a small scale project would not appear to be justified. As can be seen from the 16 km radius topographical map, the terrain between the dam and Camsell Portage is very rugged and could be expected to add considerable costs to the construction of a transmission line.

1.2 Sites Within a 16 km Radius

White Lake Dam - This is an existing power station 14 km east of Camsell Portage.

Charlot River - There are a number of rapids and a significant drop in elevation below the White Lake Dam. Development is unlikely, given the proximity to existing hydro-electric developments.

1.3 Potential Sites Beyond a 16 km Radius

Tazin Lake to Lake Athabasca - This is a potential site for large scale hydro electric development. The water elevation drops 131 m over 20 km (at the most narrow point of land).

2.0 WOOD RESOURCES

The area surrounding the community of Camsell Portage is heavily wooded with mature softwoods. No firm estimates of volume are available, however, long term supply for local heating purposes can be considered more than adequate. Further study would be required to determine if wood is available in sufficient quantities to sustain a larger consumer, such as a steam or wood gasification power generating plant. The severe terrain surrounding the community may also impede traditional harvesting techniques.

3.0 WIND RESOURCES

Very little data is available on the wind characteristics of this location. A weather station however, is located at Uranium City. Data has been collected at this site since 1959 and is presented below. The mean annual wind speed for this site is 12.2 km/hour which would indicate a generally low potential for wind power. In addition, the high frequency of calm periods during the winter months (20.0% in January; 18.5% in February) further reduces the attractiveness of this area for wind power. It should, however, be noted that wind speeds at any one particular site can be influenced by the immediately surrounding topography. Two significant topographical features, Lake Athabasca and the series of hills to the north of Camsell Portage, may influence wind characteristics in the area positively. Further investigation is required.

MEAN WIND SPEED IN KILOMETRES PER HOUR

N	9.8	10.3	12.7	15.1	16.6	1.61	14.9	14.2	14.8	11.7	10.8	10.9	13.2	N
NNE	11.5	11.4	15.0	16.6	17.9	18.0	15.3	15.0	15.2	13.7	11.9	11.9	14.5	NNE
NE	11.4	12.3	14.8	15.2	16.7	17.3	15.0	13.1	14.8	13.8	12.4	11.3	14.0	NE
ENE	10.2	10.9	11.8	12.7	13.7	13.4	11.5	10.4	12.1	10.8	12.0	9.6	11.6	ENE
E	11.9	12.2	12.8	13.6	14.8	14.0	11.8	11.4	12.6	13.6	13.5	12.3	12.9	E
ESE	14.7	15.1	16.3	17.0	17.3	16.4	15.1	15.9	15.0	16.0	15.0	15.5	15.8	ESE
SE	9.8	12.0	11.7	13.6	13.7	12.2	11.1	11.9	11.1	12.2	11.3	10.5	11.8	SE
SSE	7.7	8.9	8.4	10.8	12.0	10.2	10.0	9.9	10.5	11.4	10.8	7.8	9.9	SSE
S	5.2	6.7	7.0	8.7	10.0	8.7	9.0	8.9	8.8	10.4	10.3	6.5	8.4	S
SSW	7.1	6.4	7.2	8.5	9.9	9.7	9.8	10.9	11.1	13.6	14.2	8.5	9.7	SSW
SW	6.6	6.3	7.5	8.8	10.6	10.3	11.4	11.7	11.3	13.5	13.5	7.8	9.9	SW
WSW	8.2	7.0	8.0	9.0	10.1	10.2	11.4	12.8	12.7	13.3	12.4	7.6	10.2	WSW
W	8.7	9.0	10.8	11.5	11.1	11.5	11.7	11.8	14.1	13.9	12.7	9.1	11.3	W
WNW	12.3	12.5	14.7	16.2	16.7	16.2	14.2	14.0	15.9	15.6	13.1	11.5	14.4	WNW
NW	13.8	13.4	15.2	16.9	17.7	16.8	15.9	14.7	15.8	15.0	13.5	12.7	15.1	NW
NNW	10.2	13.2	13.5	15.6	16.7	16.3	14.9	14.5	15.3	14.1	12.3	11.3	14.0	NNW
All Directions														
	8.6	9.2	10.9	12.3	13.2	12.4	11.4	11.4	12.4	12.4	11.6	9.2	11.3	
Maximum Hourly Speed														
	50	45	53	68	64	56	52	56	48	56	53	55	68	
	ESE	NE	NE	N	NE	SVL	N	SVL	SVL	NNE	W	ESE	N	
Maximum Gust Speed														
	76	80	76	91	81	89	90	92	76	87	95	85	95	
	ESE	E	ESE	N	SVL	WNW	WSW	ENE	W	SVL	W	ESE	W	

Height of Anemometer 15.9 mm

Station Information

Location at Uranium City Airport between Ace Lake and Beaverlodge Lake just north of Lake Athabasca. Surrounding terrain is rugged low lying hills rising 90-245 m above lake level.

URANIUM CITY A SASK.

PERIOD 1959-80

Lat. 59°34'N. Long. 108°29'W

	Jan Janv	Feb Fev	Mar Mars	Apr Avr	May Mai	Jun Jum	Jul Jul	Aug Aout	Sept Sept	Oct Oct	Nov Nov	Dec Dec	Year Annuel	
Percentage Frequency														
N	2.7	2.2	3.1	3.4	3.6	3.4	4.6	5.2	4.9	4.0	5.0	3.5	3.8	N
NNE	3.5	2.9	3.6	3.5	3.7	4.6	4.4	4.0	4.5	4.3	5.2	3.8	4.0	NNE
NE	6.3	7.4	7.9	8.0	7.7	8.7	9.1	6.7	9.7	8.0	10.9	8.2	8.2	NE
ENE	18.2	20.1	18.1	17.2	14.9	13.5	12.9	12.4	14.0	12.0	16.3	18.4	15.7	ENE
E	15.1	16.1	17.6	15.7	15.5	12.3	11.0	12.4	14.0	15.3	17.0	17.4	15.0	E
ESE	3.6	5.1	6.8	8.0	8.9	7.4	4.6	7.0	6.8	7.8	6.1	6.5	6.5	ESE
SE	1.0	1.4	2.0	4.1	4.1	3.2	2.4	3.2	2.9	3.1	2.1	1.7	2.6	SE
SSE	0.9	0.9	1.5	3.1	3.6	2.7	2.4	3.0	2.9	3.3	2.3	1.1	2.3	SSE
S	0.6	0.9	1.6	2.8	3.3	3.2	2.9	3.2	2.7	3.2	1.9	0.9	2.3	S
SSW	0.9	1.4	1.9	3.1	3.9	4.8	4.3	3.7	3.3	3.8	2.8	0.7	2.9	SSW
SW	2.3	3.6	5.7	6.3	8.1	9.1	9.5	7.5	4.8	3.7	1.9	1.7	5.3	SW
WSW	4.8	3.5	4.9	4.8	5.0	6.5	7.0	6.3	3.9	3.2	2.5	2.8	4.6	WSW
W	8.3	4.7	4.0	3.4	2.5	3.9	4.8	5.2	5.9	7.4	6.3	6.5	5.2	W
WNW	5.5	4.4	3.4	3.1	2.0	2.7	3.2	3.4	4.4	5.7	4.6	3.9	3.9	WNW
NW	3.9	4.4	3.7	4.1	3.6	2.9	4.2	4.7	5.0	5.1	4.0	3.5	4.1	NW
NNW	2.4	2.5	2.6	2.1	2.6	2.1	3.1	3.7	3.4	3.0	2.7	2.3	2.7	NNW
Calm	20.0	18.5	11.6	7.3	7.0	9.0	9.6	8.4	6.9	7.1	8.4	17.1	10.9	Calme

Deschambault Lake

REMOTE COMMUNITY ANALYSIS

I. COMMUNITY PROFILE

DESCHAMBAULT LAKE

STATUS:

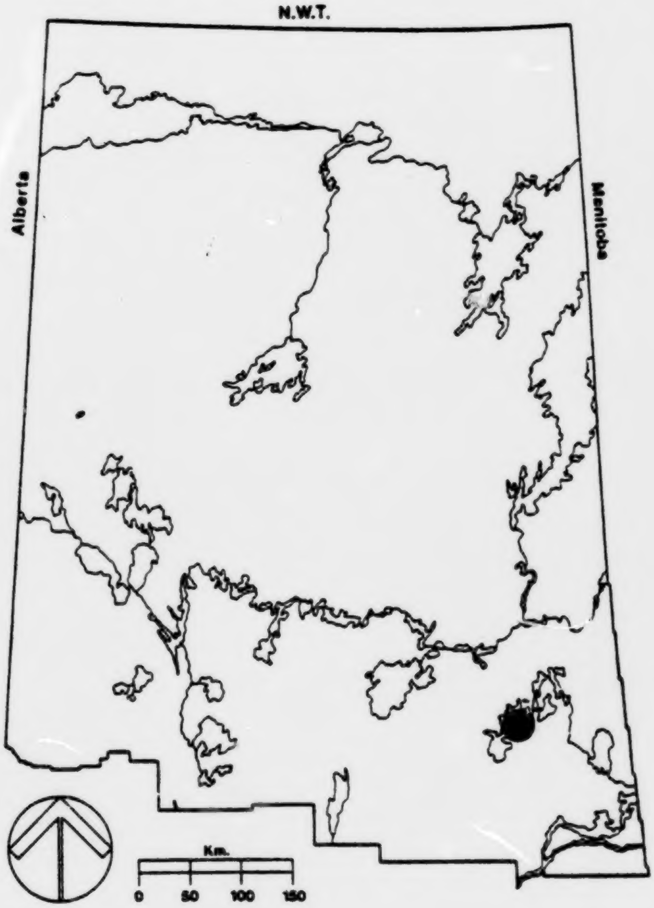
Local Advisory Council

L.A.C.

LOCATION:

Lat: $54^{\circ}55'$

Long: $103^{\circ}22'$



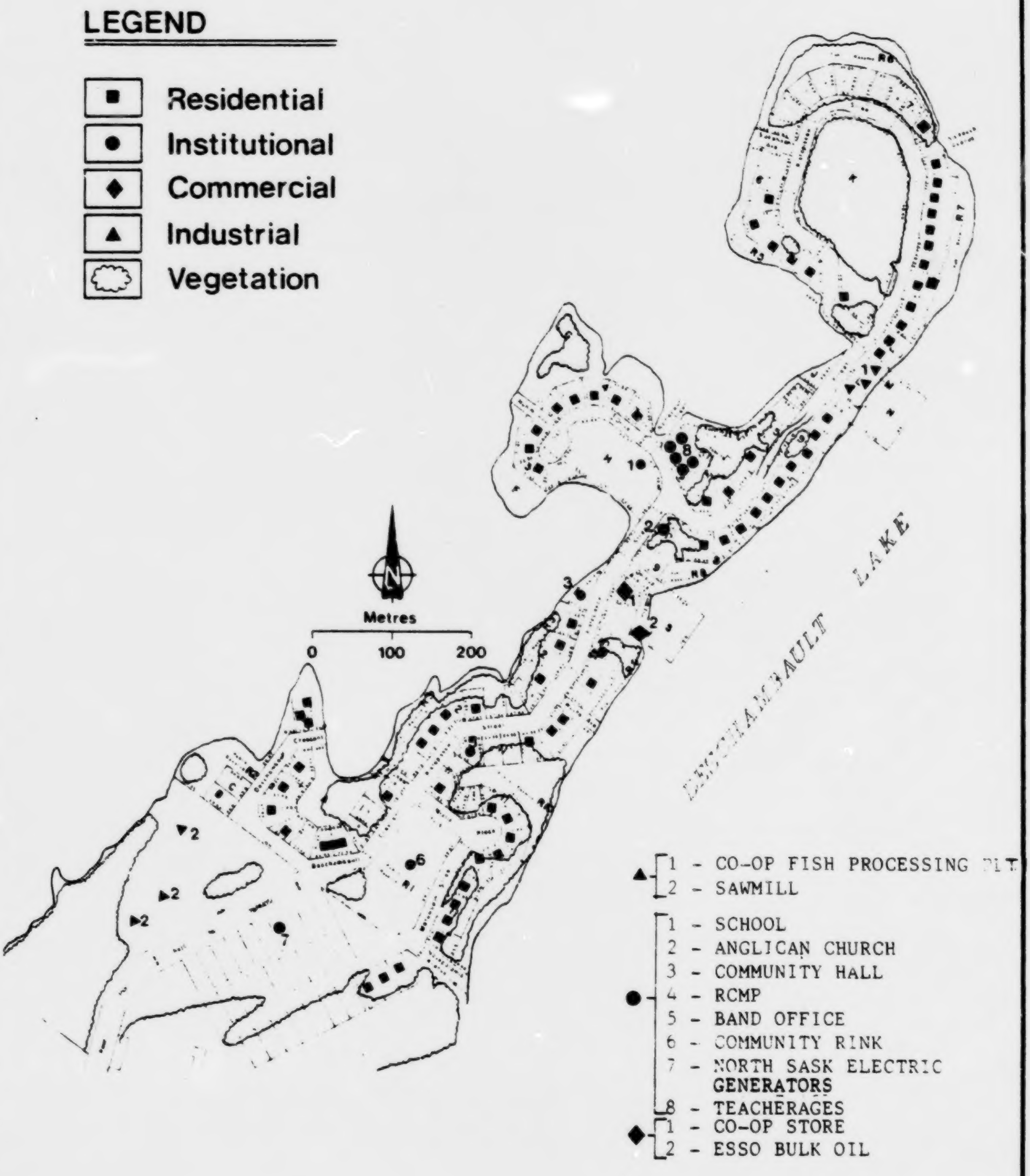
Source of Information:

Publications and Articles

Northern Saskatchewan Community Directory, August 1981.
Deschambault Community Planning Study, Preliminary Draft 1978, HFW.
Institute of Northern Studies, Settlements of Northern Saskatchewan, 1973, University of Saskatchewan.
Denosa, "Better Education in Deschambault", February 1982, p. 28-29.
Denosa, "Deschambault Develops Ski Slope", February 1981, p. 23-25.
Denosa, "Deschambault Sympathetic with Neighbours", March 1978, p. 12-13.

Interviews and Correspondence

Richard Handinson/Helmuth Knaus - D.I.A.N.D., Prince Albert District Office, January 1983.
Cal McLachlan, Manager, North-Sask Electric Ltd., La Ronge, January 1983.
Brian Ritchie, Capital Co-ordinator, Northern Lights School Division, Prince Albert, January 1983.
Larry Evans, Manager, Sask Housing Corp., Northern Department, January 1983.
Peter Cunningham, Manager, Hudson Bay Company, January 1983.
Steel Gas Utilities Ltd., Flin Flon, January 1983.
Heinz Stolle, Government Services, D.N.S., January 1983.
Gulf Oil, Flin Flon, Deschambault Lake, January 1983.
Peter Beattie, L.A.C. Office, February 1983.


LEGEND
■ Residential
● Institutional
◆ Commercial
▲ Industrial
Vegetation
N
Metres
0
100
200
DESCHAMBAULT LAKE
▲ 1 - CO-OP FISH PROCESSING PLT
2 - SAWMILL
● 1 - SCHOOL
2 - ANGLICAN CHURCH
3 - COMMUNITY HALL
4 - RCMP
5 - BAND OFFICE
6 - COMMUNITY RINK
7 - NORTH SASK ELECTRIC GENERATORS
8 - TEACHERAGES
◆ 1 - CO-OP STORE
2 - ESSO BULK OIL

Deschambault Lake

SOURCE: 1:5000 AIR PHOTO'S 1981 DNS COMMUNITY PLANNING FIELD NOTES & LEGAL PLANS-1979

A. HISTORY AND GROWTH

1. Community Established Historically established as a joint treaty/non-treaty community.

2. Demographics:

Present Population 415 (treaty), 80 (non-treaty), 22 other 1982 Municipal Census.

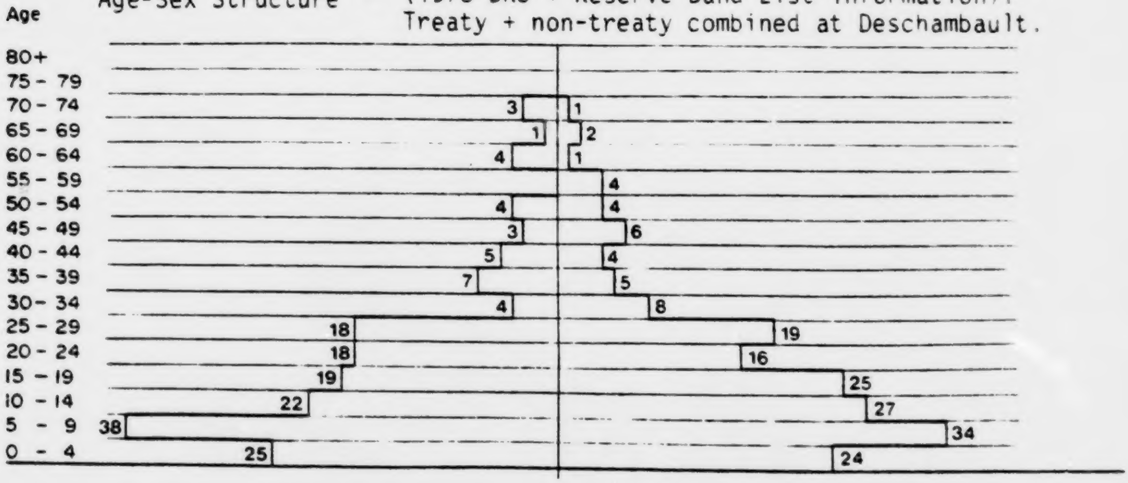
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total) (further information not available)			409						456		517

Growth % 3% medium growth.

Projected Future Population Growth @ 3% - 1985/528; 1990/612; 1995/710. Source: DNS - Community Planning Branch.

Ethnic Mix:			
	White	____ %	20%
	Metis	____ %	
(Cree)	Indian	80 %	Peter Ballantyne Band
	Other	____ %	

Age-Sex Structure - (1978 DNS + Reserve Band List information). Treaty + non-treaty combined at Deschambault.



No. of Males - 171 No. of Females - 180

B. Community Services

1. Water

Source		Distribution		Serving		Treatment	
Lake	X	Pipe		Government Buildings	X	Sedimentation	
Stream		Truck		Commercial Buildings		Filtration	X
Wells		Individual Systems	X	Residences		Chlorination	X
Other		None		Standpipes		Flouridation	
						None	

2. Sewage

Collection System		Serving		Disposal	
Pipe		Government Buildings	X	Sewage Disposal Pit (school and teacherages hooked up)	X
Truck		Commercial Buildings		Septic Tanks	
Individual Systems	X	Residences		Treatment Plant	
None				None	

3. Solid Waste Disposal

Garbage Collection Organized	X	Yes		No	
Landfill Site Utilized	X	Yes		No	(not regularly maintained)
Other Methods of Disposal		Yes	X	No	

4. Fire Protection Organized ____ Yes X No

Equipment ____

5. Police Protection - R.C.M.P. X Yes ____ No

Patrolled from Pelican Narrows

C. Community Facilities

1. Health

Clinic in Community X yes _____ no

Size of Facility Hospital 160m^2

Outpost Hospital X yes _____ no

Served By Pelican Narrows

Staff _____ Doctors 1 Nurse _____ Other

Nurse visits once per week; Doctors and Dentists have to be seen at Pelican Narrows every two weeks.

2. Education

School located in community X yes _____ no "Kistapiskaw" opened April 1981.

Kindergarten - Grade 10 Size 2,192 sq. m. Classrooms 5 plus library, Home Economics, Science Room, Industrial Arts, Photography, full size gym.

Teacherages: Size _____ sq. m. 1 triplex - 8 teachers

3. Residential

(1) Number of houses in community 82

(2) Number of houses with sewer and water 0%

(3) Number of houses with power hook-up 100%

(4) Housing condition: 19 DNS houses built since 1976. Non-treaty housing is newer (71% less than 5 years old. Reserve housing 72% more than 5 years old).

(5) Number of houses constructed annually 3-4 DNS size 90-102m^2

(6) Heat Source DNS housing - oil/wood furnaces.

(7) Cooking wood

(8) Housing construction notes: Crawl spaces instead of basements because of rock outcrops. Non reserve houses supplied by both DNS (56%) and Local Housing Group (44%). Standard construction details.

4. Community Buildings

	Type/Use	Size		Type/Use	Size
1.	Co-op Fish Processing Plant (summer use only)	140m^2	4.	Band Office	71m^2
2.	Anglican Church	N/A	5.	Community Rink	2248m^2
3.	Community Hall L.A.C.	371m^2	6.	Co-op Store	560m^2

5. Other Institutional/Commercial/Industrial Facilities (private, etc.)

	Type/Use	Size		Type/Use	Size
1.	Pump House	11.1m^2	4.		
2.	Clinic	160m^2	5.		
3.			6.		

D. Economic Activities

Agriculture		Hunting	X	Trapping	X
Fishing and Processing	X	Mining		Transportation	
Forestry		Tourism		Service Centre	X

Other ______

E. Communications and Transportation Links

(1) Post Office X yes ___ no serviced from La Ronge

Television X yes ___ no source & no. of stations

Radio X yes ___ no source & no. of stations

Telephone X yes ___ no

X individual ___ community

X local X long distance

High Frequency Radio ___ yes ___ no

operated by ______ (information not available)

F. Transportation Links

1. Access to Community by Scheduled Services

	Carrier	Frequency	Origin
Air	Charter		
Truck	- unlimited - access to Highway 106		
Bus	STC	3 times per week	Prince Albert
Other			

2. Local Transportation for Visitors

Taxi X yes ___ no ___

Rental Vehicles ___ yes X no

Charter Aircraft ___ yes X no ___ where/whom

3. Local Transportation - by Community

	Yes	No	Type
Boats	X		
Snowmobiles	X		
Cars	X		
Heavy Vehicles	X		Band truck - 500 gallon storage
Other			

G. Notes: Regarding historical growth of community.
Social composition and decision-making.
Past and future socio-economic trends.

At the Churchill River Board of Inquiry, held in 1978, the people of Deschambault indicated that they were unanimously opposed to the building of a dam. The construction impact, 75 miles away from the community's hunting, trapping and fishing grounds, would have undesirable repercussions.

Deschambault is a progressive community. Recent achievements:
- development of a downhill ski slope 2 km from community, as well as cross country trails
- new Band school
- Band operates fish plant

- new skating arena
- Band operated store
- Band owned sawmill, started November, 1980

Key factor in growth is the fact that the Peter Ballantyne Band has selected part of the community as land entitlement for a permanent reserve settlement.

Under the proposed Act, Deschambault will become incorporated as a northern hamlet.

H.1
Diesel Electric Generation

1. Location: DESCHAMBAULT LAKE [1]
2. Owner: North Sask Electric
3. Diesel Type: 2-250 KW; 1-150 KW

4.

Customers 1981	Number	1981 Consumption (KWH)
Residential	68	351,736
Commercial	8	86,177
Government	10	518,724
Street Lights	2	18,699
Total	88	975,306

Average Residential Consumption 431 kWh/Mo (1981)

Diesel Fuel:

	1981	1982	1983
Cost $	0.284	.29	.2532
Annual Fuel Use Litres	341,160	375,280[2]	412,800[2]
KWh/litre fuel	2.86	-	-
Fuel cost increases over previous year (%)	+39.9	+2.1	-14.5

Fuel Storage Capacity 3 x 22,730 = 68,190 litres

Peak Load 200 KW

Forecast Peak Loads:

1981 210 kW; 1982 230 kW; 1983 255 kW;
1984 280 kW; 1985 310 kW

Notes:
[1] Source: North Sask Electric
[2] Estimate based on 10% fuel increase p.a.

H.2 ENERGY PROFILE - ANNUAL CONSUMPTION - DESCHAMBAULT LAKE

	Annual Energy Consumption			
Classification	Electricity (MWH)	Fuel Oil (x 10^3)L	Propane (x 10^2)L	Wood (Cords)
Education	546	130	88	--
Health	18	--	400	--
Protection	1	1	--	--
Communications	68	--	--	--
Transport Services	--	--	--	--
Government	--	--	--	--
Community Services	40	35	--	--
Commercial	85	14	--	--
Residential	385	27	87	480
Total	1,143	207	575	480

H.3 ENERGY PROFILE - SOURCE FUEL CONSUMPTION

	Annual Source Fuel Consumption - Basis 1982 Facilities				
Classification	Electricity[1] (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	7,388	5,031	239	--	12,658
Health	244	--	1,088	--	1,332
Protection	14	39	--	--	53
Communications	920	--	--	--	920
Transport Services	--	--	--	--	--
Other Government	--	--	--	--	--
Community Services	541	1,355	--	--	1,896
Commercial	1,150	542	--	--	1,692
Residential	5,210	1,045	237	7,872	14,364
Total	15,467	8,012	1,564	7,872	32,915

1. Lists the consumption of source fuel (usually fuel oil) required to generate electrical energy, and uses an average performance index of 2.86 kwh/litre of fuel.

I. RESOURCE ASSESSMENT

1.0 POTENTIAL SMALL SCALE HYDRO ELECTRIC GENERATING SITES: DESCHAMBAULT LAKE

1.1 Background

Very little hydrological data is available on the area surrounding the community of Deschambault Lake. Judging from an assessment of topographical information available, no promising hydro-electric sites appear to exist within 16 km of the community. However, one potential site has been identified just beyond the 16 km radius examined for this study.

1.2 Sites Within a 16 km Radius

None.

1.3 Potential Sites Beyond a 16 km Radius

South Arm of Pelican Lake - This site is located approximately 18 km southeast of the study site. It is located where the south arm of Pelican Lake drains into the southeast corner of Deschambault Lake. Topographical surveys of the area indicate two sets of rapids occurring in a narrow gorge. Head potential is certainly under 8 m and is likely to be between 2 m to 4 m. Stream flow information is not available for this site.

2.0 WOOD RESOURCES

Research conducted by Saskatchewan Power Corporation indicates that a wood reserve of 1.7 million cords exists within a 19 km radius of the community of Deschambault Lake. Hardwoods make up 22% of the reserve, with aspen and birch being the predominant species. Softwoods make up the remaining 78%, with the major species being black spruce, jackpine and, in smaller amounts, white spruce.

In terms of the maturity of the existing resource, S.P.C. has estimated the following:

	Softwoods	Hardwoods
10-18 cm diameter class	61%	52%
20-23 cm diameter class	21%	25%
25 cm + diameter class	18%	23%

Estimates of additional biomass volumes associated with foilage and tops are:

Foliage:	140,000 - 280,000 cords
Tops:	105,000 - 227,000 cords

A small sawmill periodically operates in the community to provide local building materials.

Saskatchewan Power Corporation has concluded that a more than sufficient supply of wood exists to supply fuelwood for household needs, and feedstock for a gassification plant of a sufficient size to supply local power over a 50 year period.

3.0 WIND RESOURCES

Very little data is available on the wind characteristics of this location. However, general observations of global wind patterns indicate that during the winter months, the westerly flow of winds shift southward, subjecting northern areas of Saskatchewan to frequent periods of calm. Further investigation and monitoring of the site is necessary to determine the potential for wind at Deschambault Lake. The community, because it is situated on a peninsula in the centre of Deschambault Lake, does have good locational characteristics.

4.0 PEAT RESOURCES

Surveys of peat resources in Saskatchewan have, to date, been limited to areas south of the precambrian shield. These surveys have identified significant peat resources, starting at the shield, about 10 km south of Deschambault Lake. It is highly likely that these peat lands extend north into the immediate vicinity of the community. In this area, 60-100% of the land is covered by peatland.* Research has not yet led to the identification of potential fuel peat bogs in the Deschambault Lake area, however, the presence of significant fuel grade peat is highly likely, given the concentration of peat lands.

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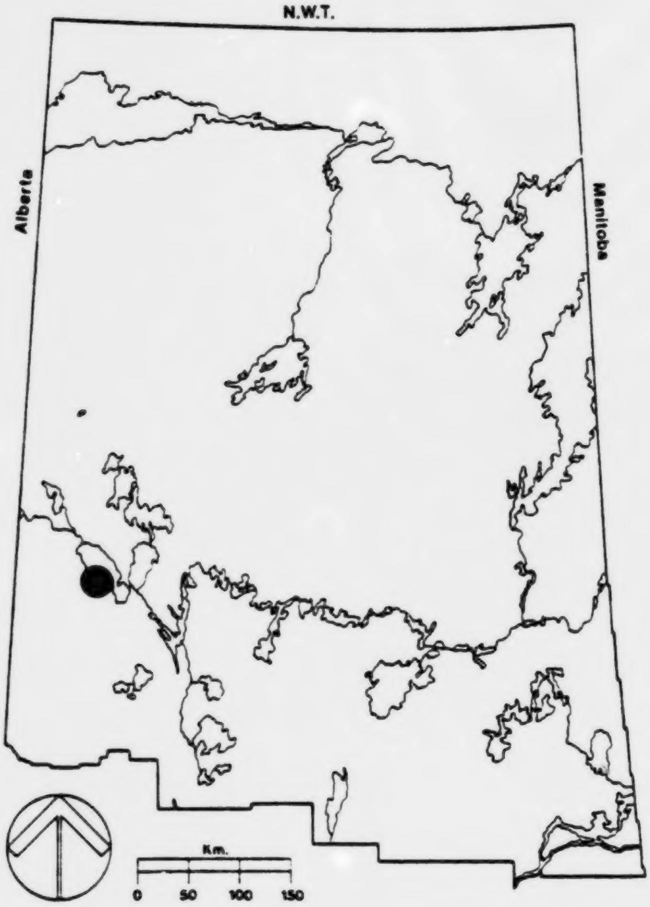
* Troyer, R., Summary of Investigations 1982, Saskatchewan Geological Survey: Fuel Peat Potential in the La Ronge Region, Saskatchewan Energy and Mines, 1982.

Dillon

REMOTE COMMUNITY ANALYSIS

I. COMMUNITY PROFILE

DILLON - BUFFALO RIVER RESERVE



STATUS:

Indian Reserve I.R. #193

LOCATION:

Lat: 108° 56' W

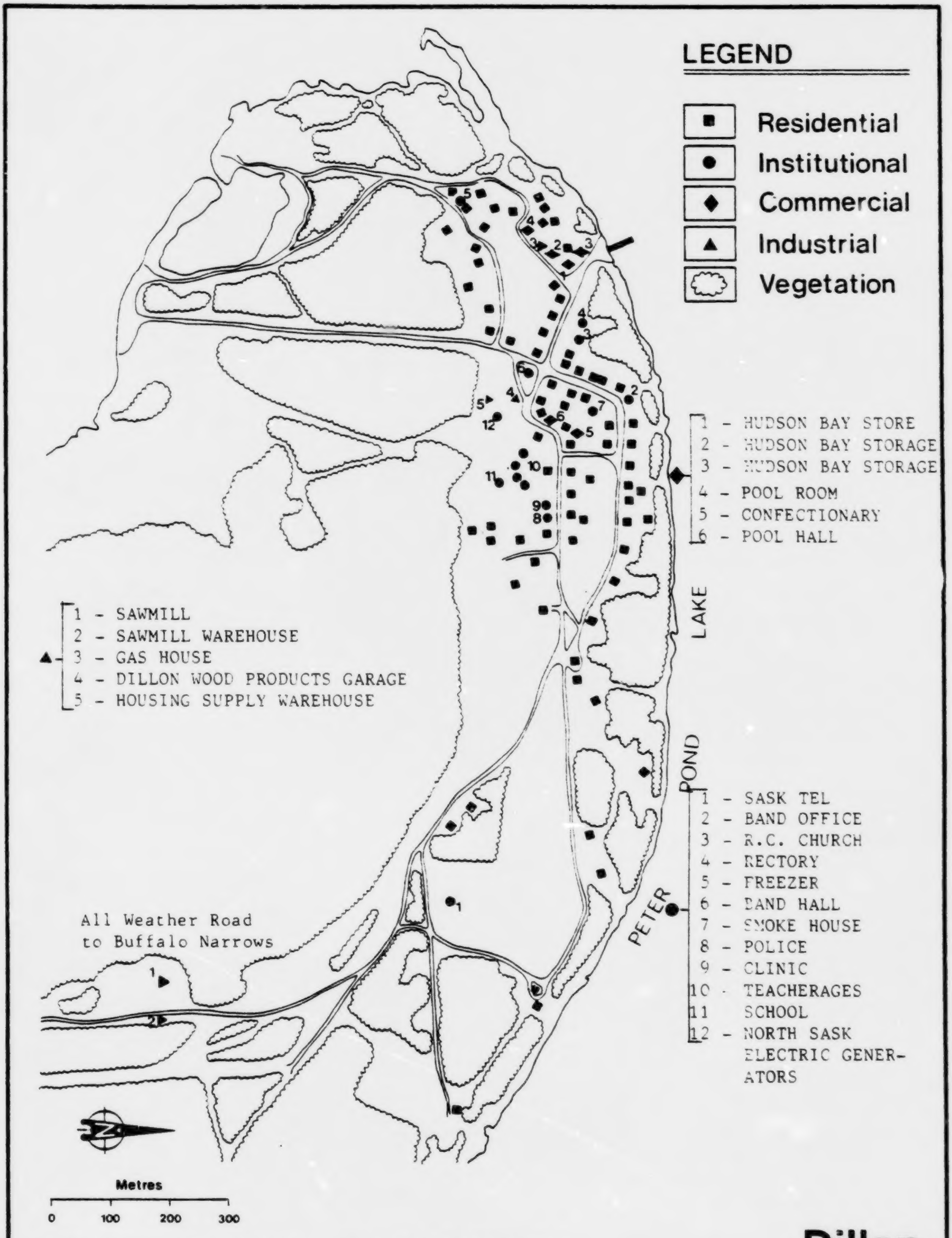
Long: 55° 56' N

Source of Information:

Underwood McLellan Ltd. Buffalo River Band Development Plan, 1980.
Northern Sask. Community Directory, August 1981.

Interviews and Correspondence

Manager, Hudson's Bay, Dillon, February 1983.
Manager, Dillon Wood Products, February 1983.
Henry Nicholas, D.I.A.N.D., Meadow Lake District Office, February 1983.
Ken Skotheim, Manager, Canada Propane, Meadow Lake, February 1983.
Bruce Clark, Clark's Bus Service (propane dealer), Buffalo Narrows, February 1983.


LEGEND
■ Residential
● Institutional
◆ Commercial
▲ Industrial
Vegetation
1 - HUDSON BAY STORE
2 - HUDSON BAY STORAGE
3 - HUDSON BAY STORAGE
4 - POOL ROOM
5 - CONFECTIONARY
6 - POOL HALL
1 - SAWMILL
2 - SAWMILL WAREHOUSE
3 - GAS HOUSE
4 - DILLON WOOD PRODUCTS GARAGE
5 - HOUSING SUPPLY WAREHOUSE
LAKE
POND
PETER
1 - SASK TEL
2 - BAND OFFICE
3 - R.C. CHURCH
4 - RECTORY
5 - FREEZER
6 - BAND HALL
7 - SMOKE HOUSE
8 - POLICE
9 - CLINIC
10 - TEACHERAGES
11 SCHOOL
12 - NORTH SASK ELECTRIC GENERATORS
All Weather Road to Buffalo Narrows
N
Metres
0
100
200
300

SOURCE: UNDERWOOD McLELLAN - BUFFALO RIVER RESERVE PLANNING STUDY - PRESENT LAND USE 1979

Dillon

A. HISTORY AND GROWTH

1. Community Established I.R. established about 1927, around

2. Demographics: an existing Hudson Bay Post.

Present Population 450

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total)	343	354	355	375	400		394		413	418	411

Growth % 2.75 per year 385 on reserve

Projected Future Population Growth Until 1975 only 56% of Band lived at Dillon, since 1976 this has increased to 92%

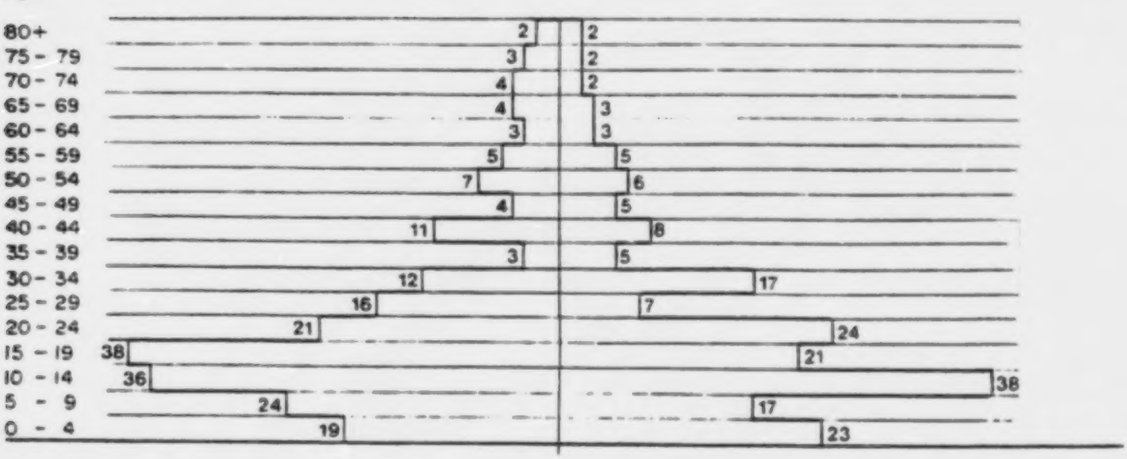
Ethnic Mix: White 2 %

Metis -- %

Indian 98 %

Other -- %

Age-Sex Structure - 1982, S.H.S.P.



No. of Males - 212 No. of Females - 188

B. Community Services

1. Water

Source		Distribution		Serving		Treatment	
Lake	X	Pipe	X	Government Buildings	X	Sedimentation	
Stream	X	Truck		Commercial Buildings	X	Filtration	
Wells		Individual Systems	X	Residences		Chlorination	
Other		None		Standpipes	X	Flouridation	
						None	X

2. Sewage

Collection System		Serving		Disposal	
Pipe		Government Buildings	X	Lagoon	
Truck		Commercial Buildings	X	Septic Tanks	X
Individual Systems	X	Residences		Treatment Plant	
None				None	

3. Solid Waste Disposal

Garbage Collection Organized X Yes ___ No

Landfill Site Utilized X Yes ___ No

Other Methods of Disposal ___ Yes X No

---

4. Fire Protection Organized ___ Yes X No

Equipment ___________________________

---

5. Police Protection - R.C.M.P. X Yes ___ No

Patrolled from Buffalo Narrows - R.C.M.P. - one member stays at Dillon.

C. Community Facilities

1. Health

Clinic in Community X yes ____ no

Size of Facility Hospital 74.3m^2

Outpost Hospital ____ yes X no

Served By Ile a la Crosse

Staff ____ Doctors ____ Nurse ____ Other (unknown)

Nearest Doctor in Buffalo Narrows/Nurse comes 3 times per week from Buffalo Narrows.

2. Education

School located in community X yes ____ no 1954 (66-67 additions)

Kindergarten - Grade 8 Size ____ sq. m. Classrooms 5 plus rec room, staff room, principal's office and living space for one staff.

Teacherages: Size ____ sq. m. 4 teacherages, single and double wide trailers, 7 teachers, 1 teacher aide, 3 NORTEP trainees.

3. Residential

(1) Number of houses in community 57

(2) Number of houses with sewer and water Teacherages only

(3) Number of houses with power hook-up 100%

(4) Housing condition: Good exterior 18%, interior 9%.

Fair Exterior 69%, inside 58% Poor Exterior 12.7%, interior 32.7%

(5) Number of houses constructed annually 4-5 size 7.3 x 9.7m^2

(6) Heat Source Wood - space heaters

(7) Cooking wood

(8) Housing construction notes: Standard pre-packaged units supplied from Meadow Lake D.I.A.N.D. factory.

4. Community Buildings

Type/Use	Size	Type/Use	Size
1. Pool Room	56m^2	5. Freezer	
2. Clinic	74.3m^2	6. Band Hall	139m^2
3. Band Office	74m^2	7. Smoke House	
4. R.C. Church and Rectory			

5. Other Institutional/Commercial/Industrial Facilities (private, etc.)

Type/Use	Size	Type/Use	Size
1. Hudson Bay Store	279m^2	5. Sask Tel	
2. Bay Residence	110m^2	6. Police	65m^2
3. Bay Residence	80m^2	7. North-Sask Electric	
4. Garage	93m^2		

D. Economic Activities

Agriculture		Hunting	X	Trapping	X
Fishing	X	Mining		Transportation	
Forestry, logging, sawmill	X	Tourism		Service Centre	

Other Have been mink ranches and handicraft operations. Future tourist potential and mixed agricultural.

E. Communications and Transportation Links

(1) Post Office X yes ____ no serviced from La Ronge

Television X yes ____ no source & no. of stations

Radio X yes ____ no ____ source & no. of stations

Telephone X yes ____ no

X individual ____ community

X local X long distance

High Frequency Radio ____ yes ____ no

operated by ________ (information unavailable)

F. Transportation Links

1. Access to Community by Scheduled Services

	Carrier	Frequency	Origin
Air	Charter: skis or pontoons		
Truck	by road		
Bus	no		
Other	Boat and private barge		

All weather road recently constructed to connect Dillon with Buffalo Narrows. This would later connect with St. George's Hill and Michel Village.

2. Local Transportation for Visitors

Taxi ____ yes X no

Rental Vehicles ____ yes X no

Charter Aircraft ____ yes X no

3. Local Transportation - by Community

	Yes	No	Type
Boats	X		
Snowmobiles	X		
Cars	X		
Heavy Vehicles	X		
Other	X		

G. Notes: Regarding historical growth of community.
Social composition and decision-making.
Past and future socio-economic trends.

Dillon scheduled for hook-up to Saskatchewan Power grid in 1983.

H.1

Diesel Electric Generation

1. Location: DILLON - ST. GEORGES HILL[1]
2. Owner: North Sask Electric
3. Diesel Type:

   3-250 KW

4.

Customers 1981	Number	1981 Consumption (KWH)
Residential	60	328,914
Commercial	4	100,072
Government	11	125,990
Street Lights	2	8,446
Total	76	537,422

Average Residential Consumption 456.8 kWh/Mo (1981)

Diesel Fuel:

	1981	1982	1983
Cost $	0.253	.2944	.2522
Annual Fuel Use Litres	328,230	361,060[2]	397,160[2]
KWh/litre fuel	2.3		-
Fuel cost increases over previous year (%)	+37.7	+16.4	-14.3

Fuel Storage Capacity 5 x 22,730 = 113,650 litres

Peak Load 200 KW (includes St. George's Hill)

Forecast Peak Loads:

1981 270 kW; 1982 360 kW; 1983 400 kW;

1984 360 kW; 1985 450 kW

Notes:

[1] Source: North Sask Electric

[2] Estimate based on 10% fuel usage increase p.a.

H.2 ENERGY PROFILE - ANNUAL CONSUMPTION - DILLON

Classification	Electricity (MWH)	Fuel Oil $(x\ 10^3)^L$	Propane $(x\ 10^2)^L$	Wood (Cords)
	Annual Energy Consumption			
Education	150	93	88	--
Health	5	3	--	--
Protection	6	3	--	--
Communications	140	--	--	--
Transport Services	--	--	--	--
Government	--	--	--	--
Community Services	38	18	--	--
Commercial	125	13	38	20
Residential	330	27	11	400
Total	794	157	137	420

H.3 ENERGY PROFILE - SOURCE FUEL CONSUMPTION

Classification	Annual Source Fuel Consumption - Basis 1982 Facilities				
	Electricity[1] (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	2,524	3,599	239	--	6,362
Health	84	116	--	--	200
Protection	101	116	--	--	217
Communications	2,356	--	--	--	2,356
Transport Services	--	--	--	--	--
Government	--	--	--	--	--
Community Services	639	696	--	--	1,335
Commercial	2,103	503	103	328	3,037
Residential	5,553	1,045	30	6,560	13,188
Total	13,360	6,075	372	6,888	26,695

1. Lists the consumption of source fuel (usually fuel oil) required to generate electrical energy, and uses an average performance index of 2.3 kwh/litre of fuel.

I. ASSESSMENT OF RESOURCES: DILLON

1.0 POTENTIAL SMALL SCALE HYDRO ELECTRIC SITES: DILLON

1.1 Background

Given the close proximity to Dillon, of the communities of St. George's Hill (5 km) and Michel Village (15 km), any potential hydro-electric facility should ideally be expected to supply electrical power to all three communities.

There appears to be only one area of limited hydro-electric potential located within the study area round Dillon.

1.2 Sites Within a 16 km Radius

Dillon River: This area of marginal small hydro potential is located about 16 km southwest of the settlement of Dillon. At this point, a number of rapids occur where the river travels through a narrow valley. No accurate measurement of head potential are available. River flow gauging measurements taken approximately 20 km upstream indicate an average annual minimum daily discharge of .707 m^3/s. On initial assessment, river flow would appear to be too small to support even a very small hydro electric station on a continuous basis. Similar conclusions were made in a general overview of small hydro in the north in a 1973 report.*

---

* S.P.C. Feasibility of Small Hydro-Electric Plants for Remote Communities in Northern Saskatchewan, S.P.C., R and D Centre, Report PE01-5335, July 1973.

2.0 WOOD RESOURCES

Research undertaken by S.P.C. indicates that standing wood reserves, within a 19 km radius of Dillon, total 1.2 million cords. About 52% of this reserve is hardwoods, (aspen and birch), and 48% are softwoods, (jackpine, black spruce and white spruce).

In terms of forest maturity, the reserve is broken down as follows:

	Softwoods	Hardwoods
10 - 18 cm diameter class	55%	42%
20 - 23 cm diameter class	17%	20%
25 + diameter class	28%	38%

Estimated additional biomass volume available from foliage and tops has been estimated by S.P.C., and is illustrated below.

Foliage:	94,000 - 187,000 cords
Tops:	70,000 - 152,000 cords

The only forest related industry in the area is a small sawmill located in Dillon and operated by the Department of Indian and Northern Affairs to supply local building materials.

S.P.C. has concluded that a more than sufficient supply of wood exists to supply feedstock for a local power/gasification plant in addition to the demand for wood that currently exists in the community. It has been estimated that a gasification plant for local power generation would consume 89,000 cords over a 50 year period.

The majority of homes heating with wood use very inexpensive tin wood stoves. Fuelwood is usually burned green within 2-3 weeks of cutting.

3.0 WIND RESOURCES

Very little data is available on wind characteristics for the community of Dillon. The federal Department of the Environment has, however, recently set up a monitoring station in Buffalo Narrows. Unfortunately, a solid base of historical data does not yet exist.

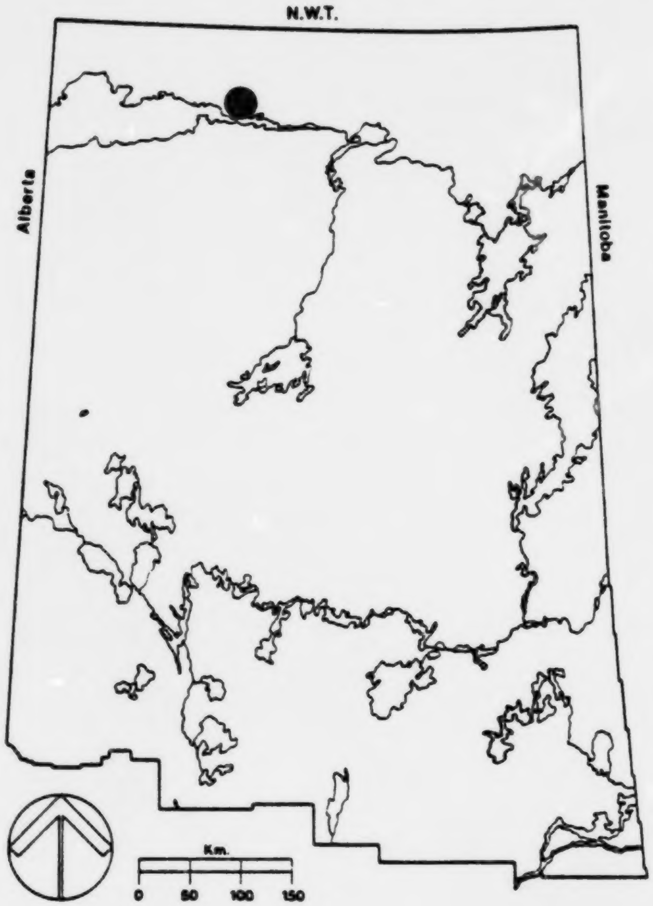
Observations made by local residents seem to indicate that the community is subject to constant strong winds, blowing from the NE across Peter Pond Lake for much of the year. Further investigation of the area surrounding Dillon, for wind potential, is highly recommended.

Fond du Lac

REMOTE COMMUNITY ANALYSIS

I. COMMUNITY PROFILE

FOND DU LAC



STATUS:

L.A.C. and Indian Reserve I.R. 227

LOCATION:

Lat: 59° 19'

Long: 107° 10'

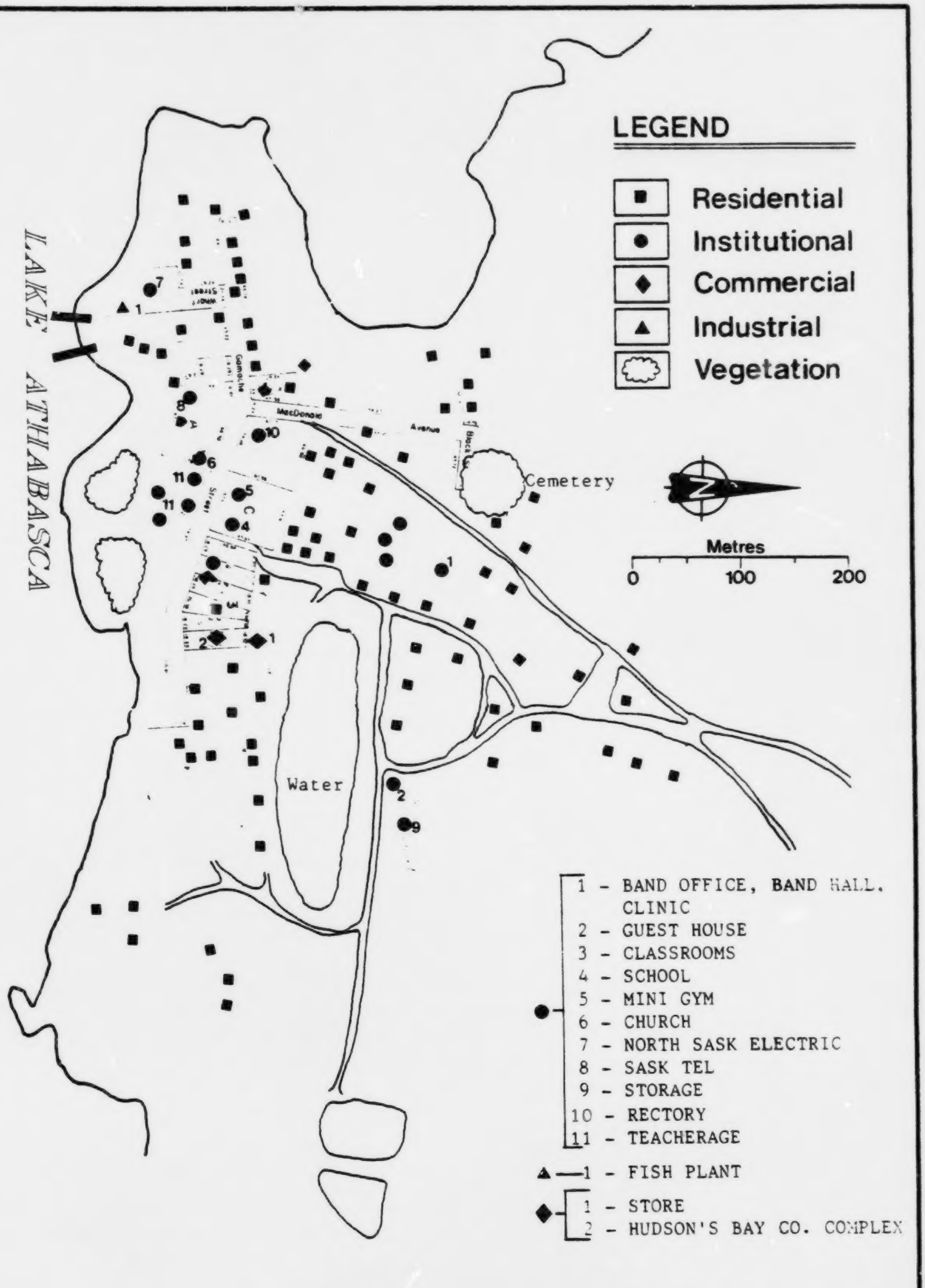
Source of Information:

Publications and Articles

Northern Saskatchewan Community Directory, August 1981.
Institute of Northern Studies, Settlements of Northern Sask. 1973.
Denosa, "Fond du Lac Priest recalls 54 years) December 81, p. 16 - 18.
Ikoy Partnership Architects Fond du Lac - Area Development Plan and Program for a multi-purpose building - 1980.

Interviews and Correspondence

Richard Handinson/Helmuth Knaus - D.I.A.N.D., Prince Albert District Office, January.
Cal McLachlan, Manager, North-Sask Electric Ltd., La Ronge, January 1983.
Brian Ritchie, Capital Co-ordinator, Northern Lights School Division, Prince Albert, January 1983.
Larry Evans, Manager, Saskatchewan Housing Corporation, Northern Department, January 1983.
David Klippenstein, Director of Planning, UMA Group, Saskatoon, January 1983.
Dennis Claffen, Manager, Imperial Fuel Dealer, Uranium City, February 1983.
Andrew Butler, Manager Hudson Bay Store, February 1983.
Band Office staff, February 1983.
Peter Ashcroft, Resource Officer, Stony Rapids, February 1983.


LEGEND
■ Residential
● Institutional
◆ Commercial
▲ Industrial
Vegetation
LAKE ATHABASCA
Cemetery
Water
Metres
0
100
200
Wharf Street
Gamache
MacDonald Avenue
Black
● 1 - BAND OFFICE, BAND HALL, CLINIC
2 - GUEST HOUSE
3 - CLASSROOMS
4 - SCHOOL
5 - MINI GYM
6 - CHURCH
7 - NORTH SASK ELECTRIC
8 - SASK TEL
9 - STORAGE
10 - RECTORY
11 - TEACHERAGE
▲ 1 - FISH PLANT
◆ 1 - STORE
2 - HUDSON'S BAY CO. COMPLEX

Fond du Lac

Source: 1:5000 Air Photo's June 1981, DNS Community Planning Plans 79

A. HISTORY AND GROWTH (Reserve)

1. Community Established approximately 1845 when Hudson's Bay Co. re-opene post. Shortly after 1847 - Mission started.

2. Demographics:

Present Population 765 persons - 519 on Reserve

December 1980 Statistics

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total) (on and off reserve except 1982 - on reserve only.	606	618	638	643	657	638	653	682			519
Growth %											

Projected Future Population Growth 3%

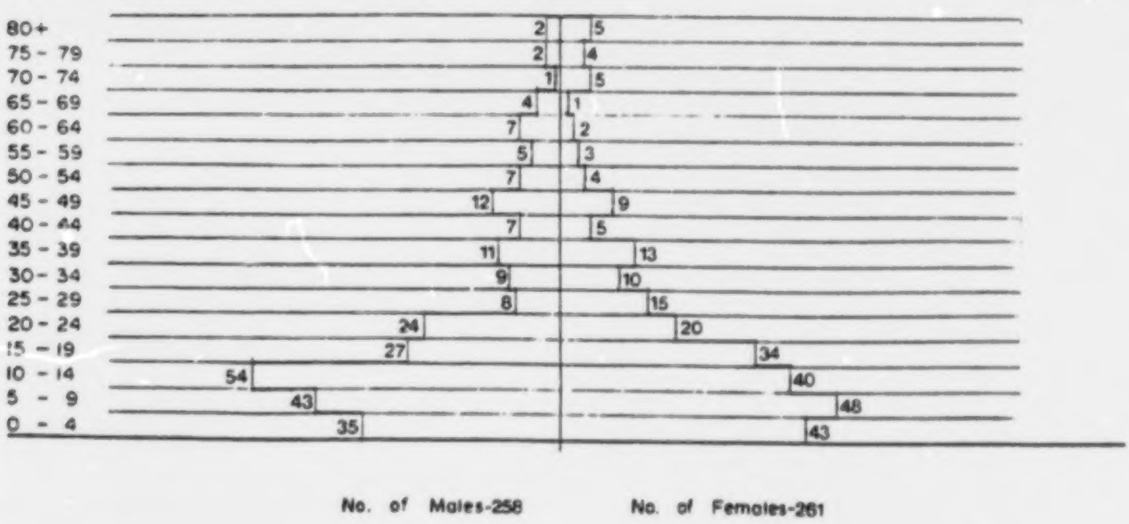
Ethnic Mix: White ____ %

Metis ____ %

Indian 100 % (Chipewyan)

Other ____ %

Age-Sex Structure (On Reserve)



A. HISTORY AND GROWTH (L.A.C.

1. Community Established first survey plan registered in 1949

2. Demographics:

Present Population 21 - SHSP Statistics

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total)	5	4	7	12	10	14	19	16	14	16	21

Growth % 3% - DNS Community Planning Estimate

Projected Future Population Growth @ 3% 1986 - 24 persons

1991 - 28; 1996 - 33

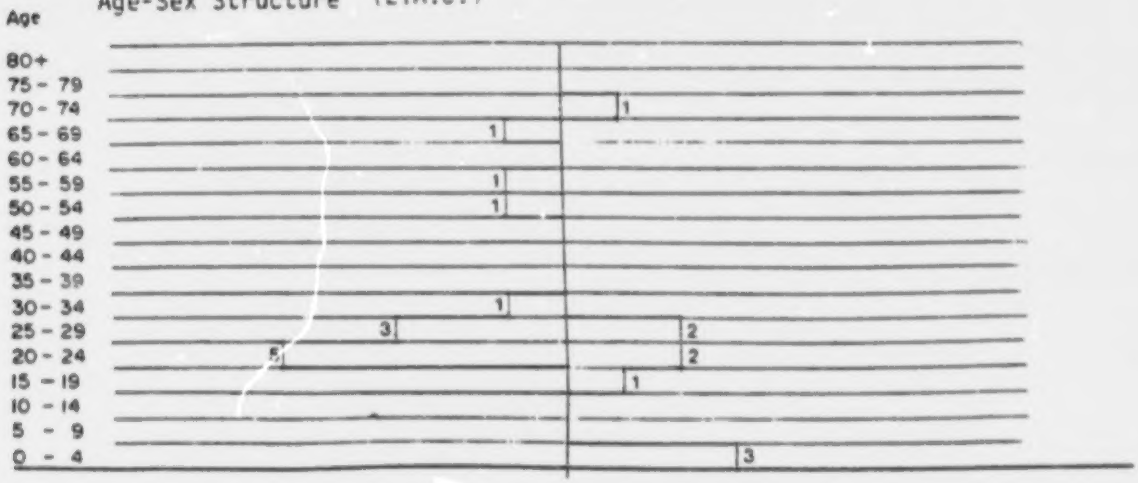
Ethnic Mix: White ______% } majority Metis

Metis ______% }

Indian ______%

Other ______% ______________

Age-Sex Structure (L.A.C.)



No. of Males 12 No. of Females 9

B. Community Services

1. Water

Source		Distribution		Serving		Treatment	
Lake	X	Pipe	X	Government Buildings	X	Sedimentation	
Stream		Truck		Commercial Buildings	X	Filtration	
Wells	X	Individual Systems		Residences		Chlorination	X
Other		None		Standpipes		Flouridation	
						None	

2. Sewage

Collection System		Serving		Disposal	
Pipe		Government Buildings	X	Lagoon	X
Truck		Commercial Buildings	X	Septic Tanks	
Individual Systems	X	Residences		Treatment Plant	
None				None	X

3. Solid Waste Disposal

Garbage Collection Organized X Yes ____ No (intermittent)
Landfill Site Utilized X Yes ____ No
Other Methods of Disposal ____ Yes X No

4. Fire Protection Organized ____ Yes X No
Equipment ____

5. Police Protection - R.C.M.P. X Yes ____ No
Patrolled from Stony Rapids

C. Community Facilities

1. Health

Clinic in Community X yes ___ no

Size of Facility Hospital Part of Community Centre

Outpost Hospital X yes X no

Served By Uranium City

Staff ___ Doctors 2 Nurse 1 Other (Community Health Work)

Doctor visits weekly from Uranium City

2. Education

School located in community X yes ___ no

Kindergarten - Grade 8 Size 1370 sq. m. Classrooms 11, mini gym

174 students

Teacherages: Size 450 sq. m.

3 - 3 bedroom, 1 duplex unit

3. Residential

(1) Number of houses in community 93

(2) Number of houses with sewer and water 1 (plus institutional)

(3) Number of houses with power hook-up 100%

(4) Housing condition: Good 10/93 newly built

Fair 65/93 Poor 17/93 - need replacement

(5) Number of houses constructed annually 5-6 size 7.3 m x 9.7 m

(6) Heat Source wood, 3 oil furnaces, 2 - 3 oil space heaters

(7) Cooking propane/wood

(8) Housing construction notes: 1982, size 7.3 m x 9.7 m;

walls - 2 x 6 - R20; ceilings - R40; floors - R20.

Sr. Citizen Building constructed, (4 plex) 1968 ($178.4m^2$)

4. Community Buildings

	Type/Use	Size		Type/Use	Size
1.	Residential & Store Hudson's Bay (5 building)	1984m^2	4.	Warehouse	53.5m^2
2.	Pool Hall & Cafe		5.	Walk in Freezer	31.2m^2
3.	Hotel		6.	Band Office & Hall (Community Centre Laundry & Clinic)	718.6m^2

5. Other Institutional/Commercial/Industrial Facilities (private, etc.)

	Type/Use	Size		Type/Use	Size
1.	Store	71m^2	4.	North Sask Electric	
2.	Water Treatment	16.1m^2	5.	Sask Tel	33m^2
3.	Fish Plant		6.		

D. Economic Activities

Agriculture		Hunting	X	Trapping	X
Fishing	X	Mining	X	Transportation	
Forestry		Tourism		Service Centre	

Other ______

E. Communications and Transportation Links

(1) Post Office X yes ___ no

Television X yes ___ no

Radio X yes ___ no ___

Telephone X yes ___ no

X individual ___ community

X local X long distance

High Frequency Radio ___ yes ___ no

operated by ______ (unknown)

F. Transportation Links

1. Access to Community by Scheduled Services

	Carrier	Frequency	Origin
Air	scheduled Norcanair	served from Uranium City	
Truck	Local		
Bus	N.A.		
Other	Barge	2-3 times per year	Ft. McMurray (Waterways)

2. Local Transportation for Visitors

Taxi _____ yes __X__ no _____

Rental Vehicles _____ yes __X__ no

Charter Aircraft __X__ yes _____ no _____

3. Local Transportation - by Community

	Yes	No	Type
Boats	X		
Snowmobiles	X		
Cars			
Heavy Vehicles			
Other			

G. Notes: Regarding historical growth of community.
Social composition and decision-making.
Past and future socio-economic trends.

- gas provided by Hudson's Bay and Adolphus Mercredi.
- with the decline of Uranium City, approximately 10 - 15 families will be moving back to Fond du Lac.

H.1
Diesel Electric Generation

1. Location: FOND DU LAC[1]

2. Owner: North Sask Electric

3. Diesel Type: 1982 - 2-250 KW; 1-150 KW
1983 - 3-150 KW

4.

Customers 1981	Number	1981 Consumption (KWH)
Residential	84	430,804
Commercial	5	86,290
Government	10	211,834
Street Lights	3	14,325
Total	102	737,815

Average Residential Consumption 427.4 kWh/Mo (1981)

Diesel Fuel:

	1981	1982	1983
Cost $	0.261	0.3403	0.3722
Annual Fuel Use Litres	302,370	332,610[2]	365,867[2]
KWh/litre fuel	2.4		-
Fuel cost increases over previous year (%)	-16.5	+30.4	+9.4

Fuel Storage Capacity 2 x 45,460 = 90,920 litres

Peak Load 160

Forecast Peak Loads:

1981 145 kW; 1982 165 kW; 1983 210 kW;
1984 380 kW; 1985 310 kW

Notes:
[1] Source: North Sask Electric
[2] Estimate based on 10% fuel usage increase p.a.

H.2 ENERGY PROFILE - ANNUAL CONSUMPTION - FOND DU LAC

Classification	Annual Energy Consumption			
	Electricity (MWH)	Fuel Oil $(x\ 10^3)^L$	Propane $(x\ 10^2)^L$	Wood (Cords)
Education	100	155	3,640	--
Health*	--	--	--	--
Protection	13	2	--	--
Communications	175	--	--	--
Transport Services	--	--	--	--
Government	--	--	--	--
Community Services	109	56	--	10
Commercial	70	357	--	15
Residential	431	5	--	620
Total	898	575	3,640	645

* Located in Band Office building (Community Services).

H.3 ENERGY PROFILE - SOURCE FUEL CONSUMPTION

Classification	Annual Source Fuel Consumption - Basis 1982 Facilities				
	Electricity[1] (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	1,613	5,999	9,990	--	17,512
Health*	--	--	--	--	--
Protection	210	77	--	--	287
Communications	2,822	--	--	--	2,822
Transport Services	--	--	--	--	--
Other Government	--	--	--	--	--
Community Services	1,758	2,167	--	164	4,089
Commercial	1,129	13,816	--	246	15,191
Residential	6,950	194	--	10,168	17,312
Total	14,482	22,253	9,900	10,578	57,213

*Located in Band Office building (Community Services).

1. Lists the consumption of source fuel (usually fuel oil) required to generate electrical energy, and uses an average performance index of 2.4 kwh/litre of fuel.

I. RESOURCE ASSESSMENTS

1.0 POTENTIAL SMALL SCALE HYDRO ELECTRIC SITES: FOND DU LAC

1.1 Background

There are a number of potential hydro electric sites worthy of note, in the general area surrounding the community of Fond du Lac. However, only two of these sites are located within the 16 km radius study area.

The topography of the land around the community of Fond du Lac, and the general area north of Fond du Lac (the waterbody), are extremely rugged, and can be expected to add a premium cost to any transmission line constructed from a generating facility. For example, a transmission line from Stony Rapids to Fond du Lac (80-100 km) has been estimated to cost approximately $10 million.

1.2 Sites Within a 16 km Radius

Warwick Rapids - Located on the final 2 km before the Bulya River empties into Lake Athabasca, the river drops about 5 m over a 2 km stretch. No stream flow data for this site exists.

Shannon Lake, located just north of the rapids, appears to have storage potential that would be used to increase capacity. This site is located on native entitlement lands (I.R. 227), approximately 14 km east of the settlement of Fond du Lac.

Bulya River - This potential hydro site, identified by S.P.C., is located approximately 10 km north of the settlement of Fond du Lac. In this location, the river drops dramatically over a 15 km stretch. Very little additional information is currently available on this site.

1.3 Potential Sites Beyond a 16 km Radius

Grease River - The Grease River has a drainage area of approximately 4840 km^2, that flows into Lake Athabasca from the northeast, 22 km east of the Fond du Lac settlement. Upstream from the mouth of the river, the river valley narrows considerably and falls approximately 60 m over a 3 km stretch. Limited flow data available since records for this river which were established in 1973, indicate a minimum daily discharge of 16.4 m^3/s. There would appear to be firm hydro-electric development potential of up to 8 Mw generating capacity available, (assuming 80% generating efficiency). Additional capacity may be gained through regulation of the river flow.

Otherside River - This river flows north into Fond du Lac and has tentatively been identified by S.P.C. as a potential small hydro site. Very limited minimum daily discharge figures indicate a flow of 11.6 m^3/s. Further investigation is necessary to determine actual head potential.

2.0 WOOD RESOURCES

Wood reserves in the area surrounding the community of Fond du Lac are considered more than adequate to satisfy current demand over the long term. Detailed forest inventory data is not available for that location, however it is known that the dominant species in the area are jackpine and spruce, with scattered occurrences of birch, aspen and tamarack. The Department of Northern Saskatchewan has estimated that reserves are in the order of 2.5-17 cords per hectare. Based on a 19 km radius, standing wood reserves of 289,000 - 20,025,000 can be expected to be available in the vicinity of the community.

3.0 WIND RESOURCES

Very little data is available on the wind characteristics of this location. General observations of global wind patterns indicate that during the winter months, the westerly flow of winds shift south, subjecting the northern areas of Saskatchewan to frequent periods of calm. Further investigation of the microclimatic factors surrounding the community, (including significant topographical features), would be required to establish the potential for wind at this site. The nearest weather station that collects data on wind characteristics is at Uranium City.

Garson Lake

REMOTE COMMUNITY ANALYSIS

I. COMMUNITY PROFILE

GARSON LAKE

STATUS:

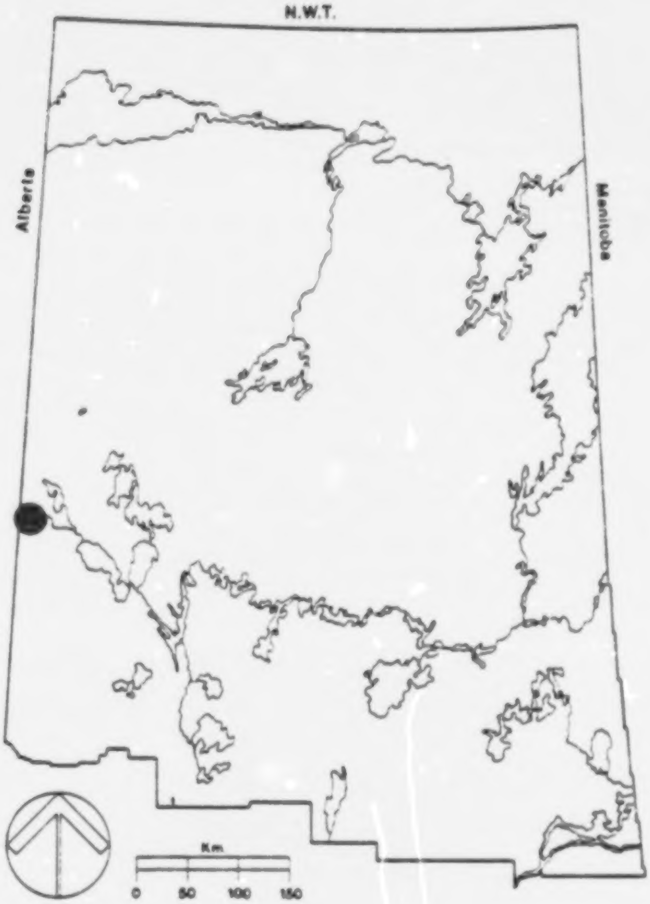
Local Advisory Council

L.A.C.

LOCATION:

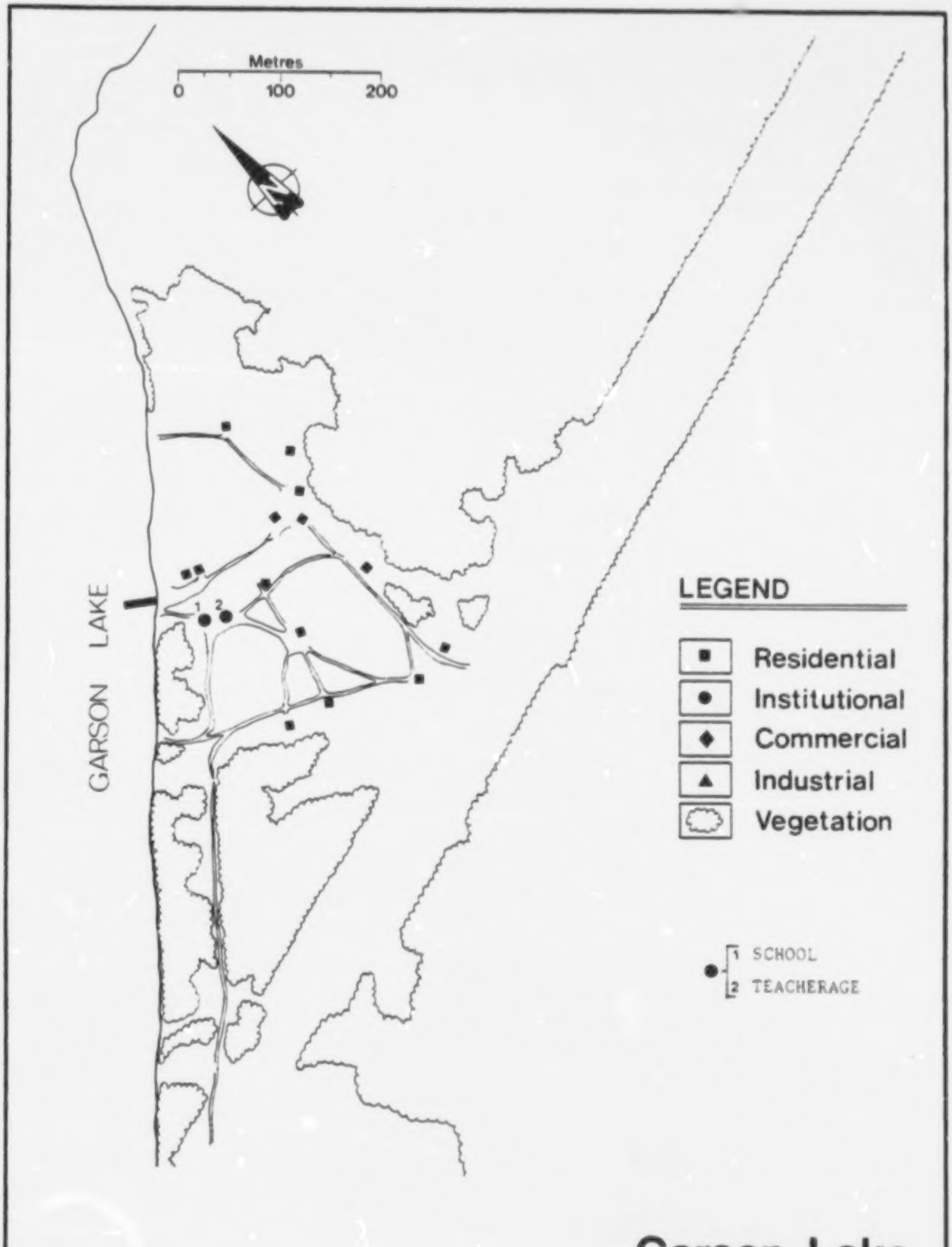
Lat.: 56° 19' N

Long.: 109° 58' W



Source of Information:

Institute of Northern Studies, Settlements of Northern Saskatchewan.
Northern Sask. Community Directory, August 1981, p. 20.
DNS - Air Photos, 1979.
Brian Ritchie, Capital Co-ordinator, Northern Lights School Division, Prince Albert, January 1983.
Manager, Imperial Oil, Buffalo Narrows, February 1983.


Metres
0
100
200
GARSON LAKE
1
2
LEGEND
■ Residential
● Institutional
◆ Commercial
▲ Industrial
Vegetation
● 1 SCHOOL
2 TEACHERAGE

Garson Lake

SOURCE:: 1:5000 AIR PHOTO'S 1979

A. HISTORY AND GROWTH

1. Community Established a traditional community, additional information not available

2. Demographics:

Present Population 86

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total)		20							84		

Growth % Municipal Census - medium growth 3%.

Projected Future Population Growth 1985 - 97 persons 1990 - 112, 1995 - 130. Source: DNS Community Planning Branch.

Ethnic Mix: White ____ % N/A

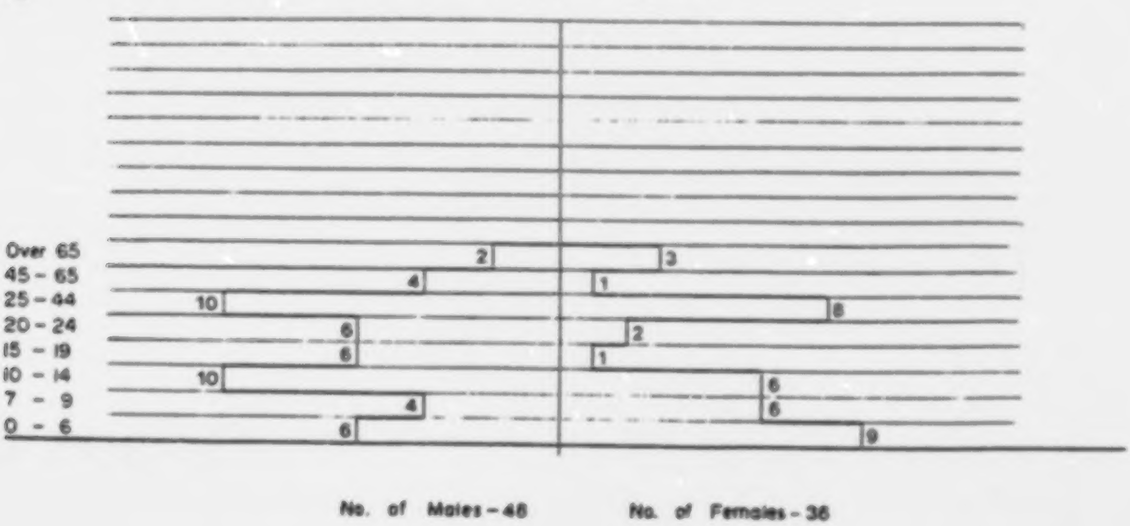
Metis 85 %

(Chipewyan) Indian 15 %

approximately

Other ____ %

Age-Sex Structure (1980 Municipal Census)



B. Community Services

1. Water

Source		Distribution		Serving		Treatment	
Lake	X	Pipe		Government Buildings		Sedimentation	
Stream		Truck		Commercial Buildings		Filtration	
Wells		Individual Systems		Residences		Chlorination	
Other		None		Standpipes		Flouridation	
		Buckets	X			None	X

2. Sewage

Collection System		Serving		Disposal	
Pipe		Government Buildings		Lagoon	
Truck		Commercial Buildings		Septic Tanks	
Individual Systems (Outhouses)	X	Residences		Treatment Plant	
				None	X

3. Solid Waste Disposal

Garbage Collection Organized		Yes	X	No
Landfill Site Utilized		Yes	X	No
Other Methods of Disposal		Yes	X	No

4. Fire Protection Organized

Fire Protection Organized		Yes	X	No

Equipment ______________________________

5. Police Protection - R.C.M.P.

Police Protection - R.C.M.P.	X	Yes		No

Patrolled from La Loche R.C.M.P.

C. Community Facilities

1. Health

Clinic in Community ______ yes __X__ no

Size of Facility Hospital __N/A__

Outpost Hospital __X__ yes __X__ no

Served By __La Loche__

Staff ____ Doctors ____ Nurse ________ Other

Public Health Nurse visits irregularly. Doctors from Ile a la Crosse.

2. Education

School located in community __X__ yes ______ no 1977

Kindergarten - Grade 9 Size __167__ sq. m. Classrooms __2__

Teacherages: Size ______ sq. m. __1 teacher, 34 students__

3. Residential

(1) Number of houses in community __13__

(2) Number of houses with sewer and water __0%__

(3) Number of houses with power hook-up __0%__

(4) Housing condition: Good __information not available__

Fair ____________ Poor ____________

(5) Number of houses constructed annually __very few__ size ______

(6) Heat Source __Wood__

(7) Cooking __Wood__

(8) Housing construction notes: Houses are locally built, containing 1 or 2 rooms. No provincial housing program as there are no surveyed lots. Log houses or wood frame with chipboard. Two or three houses have Treaty residents. D.I.A.N.D. provided materials for additions.

4. Community Buildings

	Type/Use	Size		Type/Use	Size
1.	Community Store	50m^2	4.		
2.	(a part of a local house)		5.		
3.			6.		

5. Other Institutional/Commercial/Industrial Facilities (private, etc.)

	Type/Use	Size		Type/Use	Size
1.			4.		
2.			5.		
3.			6.		

D. Economic Activities

Agriculture ____ Hunting X Trapping X

Fishing X Mining ____ Transportation ____

Forestry ____ Tourism ____ Service Centre ____

Other ____

E. Communications and Transportation Links

(1) Post Office ____ yes X no serviced from La Loche

Television ____ yes X no source & no. of stations

Radio ____ yes X no ____ source & no. of stations

Telephone ____ yes X no

____ individual ____ community

____ local ____ long distance

High Frequency Radio X yes ____ no

operated by La Loche

F. Transportation Links

1. Access to Community by Scheduled Services

	Carrier	Frequency	Origin
Air	Charter-skis or float plane		sed airstrip
Truck	only winter road access to La Loche		
Bus	N/A		
Other			

2. Local Transportation for Visitors

Taxi ____ yes _X_ no

Rental Vehicles ____ yes _X_ no

Charter Aircraft ____ yes _X_ no where/whom

3. Local Transportation - by Community

	Yes	No	Type
Boats	X		
Snowmobiles	X		
Cars		X	
Heavy Vehicles			
Other			

G. Notes: Regarding historical growth of community.
Social composition and decision-making.
Past and future socio-economic trends.

No electricity. Very little information known about this community.

Garson Lake has been a traditional community for some time. Close links with La Loche and La Loche Band.

Recognized in 1978 when a two room school and teacherage was constructed.

Became an L.A.C. Presently a proposal was to establish legal surveys. Under the proposed Act, Garson Lake will be a settlement not incorporated.

H.1

Diesel Electric Generation

1. Location: GARSON LAKE
2. Owner: Northern Lights School Board
3. Diesel Type:
4. No information available

Customers 1981	Number	1981 Consumption (KWH)
Residential Commercial Government Street Lights		
Total		

Average Residential Consumption ________ kWh/Mo (1981)

Diesel Fuel:

	1981	1982	1983
Cost $			
Annual Fuel Use Litres			
KWh/litre fuel			
Fuel cost increases over previous year (%)			

Fuel Storage Capacity

Peak Load

Forecast Peak Loads:

1981 ______ kW; 1982 ______ kW; 1983 ______ kW;

1984 ______ kW; 1985 ______ kW

Notes:

H.2 ENERGY PROFILE - ANNUAL CONSUMPTION - GARSON LAKE

Classification	Annual Energy Consumption			
	Electricity (MWH)	Fuel Oil $(\times 10^3)$L	Propane $(\times 10^2)$L	Wood (Cords)
Education	--	42*	--	30
Health	--	--	--	--
Protection	--	--	--	--
Communications	--	--	--	--
Transport Services	--	--	--	--
Government	--	--	--	--
Community Services	--	--	--	--
Commercial	--	--	--	--
Residential	--	--	--	170
Total	--	42	--	200

*Includes fuel for electric power generation.

H.3 ENERGY PROFILE - SOURCE FUEL CONSUMPTION

Classification	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
	Annual Source Fuel Consumption - Basis 1982 Facilities				
Education	--	1,625*	--	492	2,117
Health	--	--	--	--	--
Protection	--	--	--	--	--
Communications	--	--	--	--	--
Transport Services	--	--	--	--	--
Other Government	--	--	--	--	--
Community Services	--	--	--	--	--
Commercial	--	--	--	--	--
Residential	--	--	--	2,788	2,788
Total	--	1,625	--	3,280	4,905

*Includes fuel for electric power generation.

I. ASSESSMENT OF RESOURCES: GARSON LAKE

1.0 POTENTIAL SMALL SCALE HYDRO ELECTRIC SITES: GARSON LAKE

1.1 Background

There are very few significant topographical features in the general area surrounding Garson Lake to indicate any small hydro-electric potential within a reasonable distance.

1.2 Sites Within a 16 km Radius

None.

2.0 WOOD RESOURCES

Due to the recent establishment of this community and its relative isolated location, no detailed information was readily attainable for this study. Forestry inventory data can be disaggregated from information held by the Forestry Branch, Department of Tourism and Renewable Resources. Unfortunately, this information was not received in time to be included in this report.

A general assessment of forest resources can be obtained from previous inventory surveys prepared by the Forestry Branch. To the north of the community, the land is poorly drained, treed muskeg. Various sizes of spruce, aspen, birch and tamarack can be found. To the south of the community is a large stand of mature timber of merchantable size (over 9 m in height), with the predominant spruces being jackpine and black spruce.

At present, Garson Lake is highly dependent on wood as a fuel resource. All homes are heated 100% with wood, and the school utilizes combined wood/oil space heating. Inexpensive fabricated tin stoves are used in all dwellings for heating and cooking.

Wood resources in the area are plentiful and more than enough to sustain a growing population, or a wood fueled alternative electric generation system.

3.0 WIND RESOURCES

No data is available on the wind characteristics of this location. General observations of global wind patterns and their effect on northern Saskatchewan, seems to indicate, that due to the southerly movement of westerly winds during winter months, the northern portions of the province are subject to frequent periods of calm. These periods of calm may have a significant detremental effect on the feasibility of utilizing wind power.

4.0 PEAT

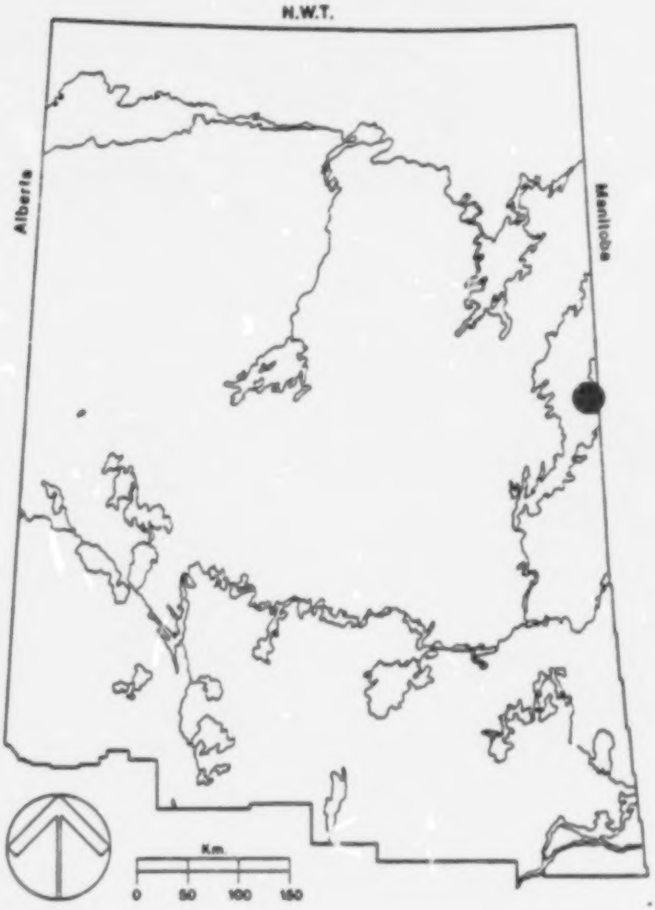
The area in the vicinity of Garson Lake has been identified in research undertaken by Saskatchewan Energy and Mines, to be an area of 20-60% peat lands. Due to the settlement's remote nature, no detailed study of potential fuel peat deposits has, as of yet, been undertaken in this area. However, topographical mapping and forest inventory data indicate that a significant area of poorly drained, treed muskeg is located adjacent to, and directly to the north of the community. Further investigation is required to determine the presence of peat suitable for use as a combustion fuel.

Kinoosao

REMOTE COMMUNITY ANALYSIS

I. COMMUNITY PROFILE

KINOOSAO



STATUS:

Local Advisory Council

L.A.C.

LOCATION:

Lat: 57°05'

Long: 102°10'

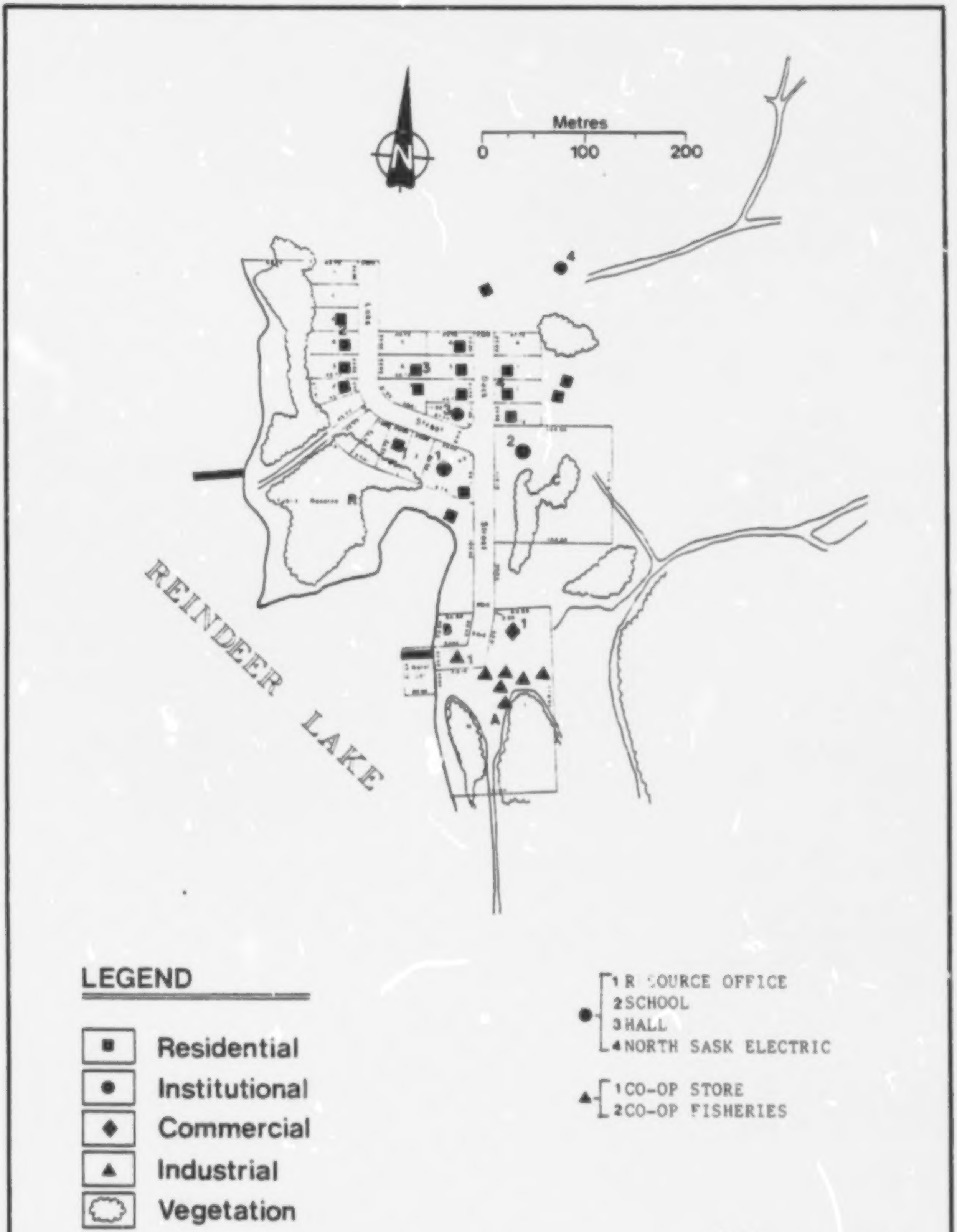
Source of Information:

Publications and Articles

Denosa, "Kinoosao" February 82, p. 20-22.
Denosa, "Expanded Facilities for Kinoosao Store" August 1982, p. 11.
Institute of Northern Studies, "Settlements of Northern Sask.", University of Saskatchewan, 1973.
Northern Sask. Community Directory, August 1981, p. 26.
"Saskatchewan Indian Community Environmental Profiles", 1977, p. 39.

Interviews and Correspondence

Larry Evans, Manager, Sask Housing Corp., Northern Department, January 1983.
Brian Ritchie, Capital Co-ordinator, Northern Lights School Division, Prince Albert, January 1983.
Cal McLachlin, Manager, North-Sask Electric, La Ronge, January 1983.
Tom Fraser, Community Planner, DNS, Prince Albert, January 1983.
Manager, Kinoosao Co-op, January 1983.
G. Scrimshaw, Manager, Gulf Oil, Lynn Lake, February 1983.
Cam Neelie, Manager, Steel Gas Propane, Lynn Lake, February 1983.


N
Metres
0
100
200
REINDEER LAKE
LEGEND
Residential
Institutional
Commercial
Industrial
Vegetation
1 RESOURCE OFFICE
2 SCHOOL
3 HALL
4 NORTH SASK ELECTRIC
1 CO-OP STORE
2 CO-OP FISHERIES

Kinoosao

SOURCE: 1:5000 AIR PHOTO'S JUNE 81 LEGAL PLAN - DNS COMMUNITY PLANNING 1975

A. HISTORY AND GROWTH

1. Community Established ______________________________

2. Demography:

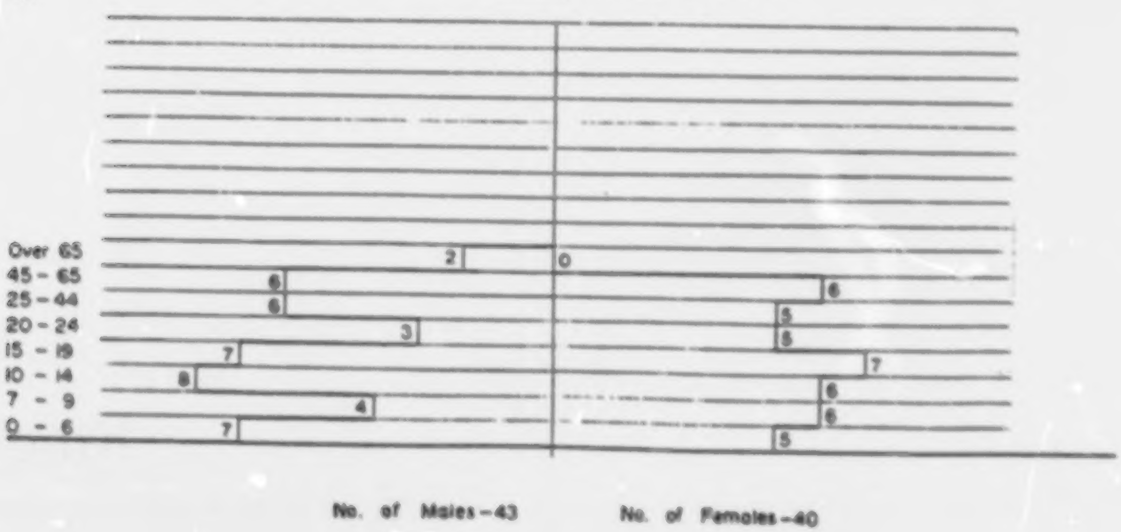
Present Population 81 - 1981 Census Canada

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total)			115			75			83	81	
Growth %											

Projected Future Population Growth ______________________________

Ethnic Mix:		
White	____ %	information unavailable
Metis	____ %	information unavailable
Indian	____ %	information unavailable
Other	____ %	______________________

Age-Sex Structure - 1980 Municipal Census Data



B. Community Services

1. Water

Source		Distribution		Serving		Treatment	
Lake	X	Pipe		Government Buildings	X	Sedimentation	
Stream		Truck		Commercial Buildings	X	Filtration	
Wells	X	Individual Systems	X	Residences	X	Chlorination	
Other		None		Standpipes		Flouridation	
						None	X

2. Sewage

Collection System		Serving		Disposal	
Pipe		Government Buildings	X	Lagoon	
Truck		Commercial Buildings	X	Septic Tanks	X
Individual Systems	X	Residences		Treatment Plant	
None				None	

3. Solid Waste Disposal

Garbage Collection Organized X Yes ___ No 1/2 truck
Landfill Site Utilized X Yes ___ No
Other Methods of Disposal ___ Yes X No

4. Fire Protection Organized ___ Yes X No
Equipment ___________

5. Police Protection - R.C.M.P. X Yes ___ No
Patrolled from La Ronge.

C. Community Facilities

1. Health

Clinic in Community ____ yes X no

Size of Facility Hospital Not applicable

Outpost Hospital X yes ____ no

Served By La Ronge or Lynn Lake (Manitoba).

Staff ____ Doctors ____ Nurse ____ Other

Health and Welfare - Doctor once a month from Lynn Lake Lake. Nurses 1-2 times per month.

2. Education

School located in community X yes ____ no Atco trailers C 1974.

Kindergarten - Grade 10 Size 186 sq. m. Classrooms ____

Teacherages: Size ____ sq. m. 2 teachers, 2 teacher aides, 38 students.

3. Residential

(1) Number of houses in community - 10 DNS houses, 8 other. 7 - 1975
3 - 1980

(2) Number of houses with sewer and water 0%

(3) Number of houses with power hook-up 100%

(4) Housing condition: Good ____

Fair ____ Poor ____

(5) Number of houses constructed annually - infrequent Size DNS - 90-100m^2

(6) Heat Source DNS houses - wood/oil furnaces

(7) Cooking ____

(8) Housing construction notes: DNS standard construction:
basements CMHC standards - R20 walls, R40 ceilings.

4. Community Buildings

	Type/Use	Size		Type/Use	Size
1.	Co-op Store		4.	DTRR Garage	136.9m^2
2.	North-Sask El., warehouse, office and health	93,6m^2	5.		
3.	Resource Office	55.4m^2	6.		

5. Other Institutional/Commercial/Industrial Facilities (private, etc.)

	Type/Use	Size		Type/Use	Size
1.			4.		
2.			5.		
3.			6.		

D. Economic Activities

Agriculture		Hunting		Trapping	
Fishing	X	Mining		Transportation	
Forestry		Tourism Outfitting	X	Service Centre	

Other Fish Plant closed down 1979/fish shipped to southern processing centres, La Ronge, Winnipeg.

E. Communications and Transportation Links

(1) Post Office X yes ___ no flown in on an irregular basis from Lynn Lake.

Television ___ yes X no source & no. of stations

Radio X yes ___ no source & no. of stations

Telephone ___ yes X no (being investigated by Sask Tel)

___ individual ___ community

___ local ___ long distance

High Frequency Radio X yes ___ no poor reception

operated by ___________

F. Transportation Links

1. Access to Community by Scheduled Services

	Carrier	Frequency	Origin
Air	by charter, float and ski		
Truck	road link to Lynn Lake only open a few months of year		
Bus			
Other			

2. Local Transportation for Visitors

Taxi ____ yes ____ no X

Rental Vehicles ____ yes X no

Charter Aircraft ____ yes X no ____ where/whom

3. Local Transportation - by Community

	Yes	No	Type
Boats	X		
Snowmobiles	X		
Cars			information unavailable
Heavy Vehicles			
Other			

G. Notes: Regarding historical growth of community.
Social composition and decision-making.
Past and future socio-economic trends.

This community is the most isolated of all Saskatchewan remote centres. Because most families are non-treaty, they encounter restrictions which would otherwise help them cope with the high cost of living. Licenses are required to hunt, fish, trap and cut wood.

Relocating the community during 1980 was discussed but dismissed, due to cost ($9 million). Focus now on improving facilities and links with other communities.

Under the proposed Act, Kinoosao will become a settlement not incorporated.

H.1

Diesel Electric Generation

1. **Location:** KINOOSAO [1]
2. **Owner:** North Sask Electric
3. **Diesel Type:** 1-75 KW; 1-100 KW
4.

Customers 1981	Number	1981 Consumption (KWH)
Residential	13	75,272
Commercial	1	11,008
Government	5	39,315
Street Lights	2	4,240
Total	21	129,835

Average Residential Consumption 482.5 kWh/Mo (1981)

Diesel Fuel:

	1981	1982	1983
Cost $	0.267	0.3020	0.2852
Annual Fuel Use Litres	89,940	98,940[2]	108,830[2]
KWh/litre fuel	1.44		-
Fuel cost increases over previous year (%)	+26.3	+13.1	+5.6

Fuel Storage Capacity 5 x 22730 = 113650 litres

Peak Load 47 KW

Forecast Peak Loads:

1981 40 kW; 1982 45 kW; 1983 52 kW;

1984 58 kW; 1985 65 kW

Notes:
[1] Source: North Sask Electric
[2] Estimate based on 10% fuel usage increase p.a.

H.2 ENERGY PROFILE - ANNUAL CONSUMPTION - KINOOSAO

Classification	Annual Energy Consumption Electricity (MWH)	Fuel Oil ($\times 10^3$)L	Propane ($\times 10^2$)L	Wood (Cords)
Education	36	11	20	--
Health	--	--	--	--
Protection	--	--	--	--
Communications	--	--	--	--
Transport Services	--	--	--	--
Government	9	5	--	--
Community Services	6	2	--	10
Commercial	11	9	--	--
Residential	75	18*	36	130
Total	137	45	56	140

*Most homes have oil furnaces or heaters - but minimally utilized.

H.3 ENERGY PROFILE - SOURCE FUEL CONSUMPTION

Classification	Annual Source Fuel Consumption - Basis 1982 Facilities				
	Electricity[1] (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	968	426	54	--	1,448
Health	--	--	--	--	--
Protection	--	--	--	--	--
Communications	--	--	--	--	--
Transport Services	--	--	--	--	--
Other Government	242	194	--	--	436
Community Services	162	77	--	164	403
Commercial	296	348	--	--	644
Residential	2,016	697*	98	2,132	4,943
Total	3,684	1,742	152	2,296	7,874

*Most homes have oil furnaces or heaters - but minimally utilized.

1. Lists the consumption of source fuel (usually fuel oil) required to generate electrical energy and uses an average performance index of 1.44 kwh/litre of fuel.

I. ASSESSMENT OF RESOURCES: KINOOSAO

1.0 POTENTIAL SMALL SCALE HYDRO ELECTRIC SITES

1.1 Background

There are no significant topographical or hydrological features to indicate small scale hydro-electric potential within 16 km of Kinoosao.

1.2 Sites Within a 16 km Radius

None.

2.0 WOOD RESOURCES

No detailed information is available on the forest reserves surrounding this community. However, Saskatchewan Power Corporation has made a very tentative estimation of wood volumes available. Based on Saskatchewan Power Corporation estimates, a range of 0.3 to 2.0 million wide exists within a 19 km radius of the community. Major species can be expected to be jackpine, black spruce, aspen, birch and tamarack.

The majority of homes in Kinoosao heat with wood for economic reasons. Many homes have oil space heaters or furnaces that are minimally utilized.

3.0 WIND RESOURCES

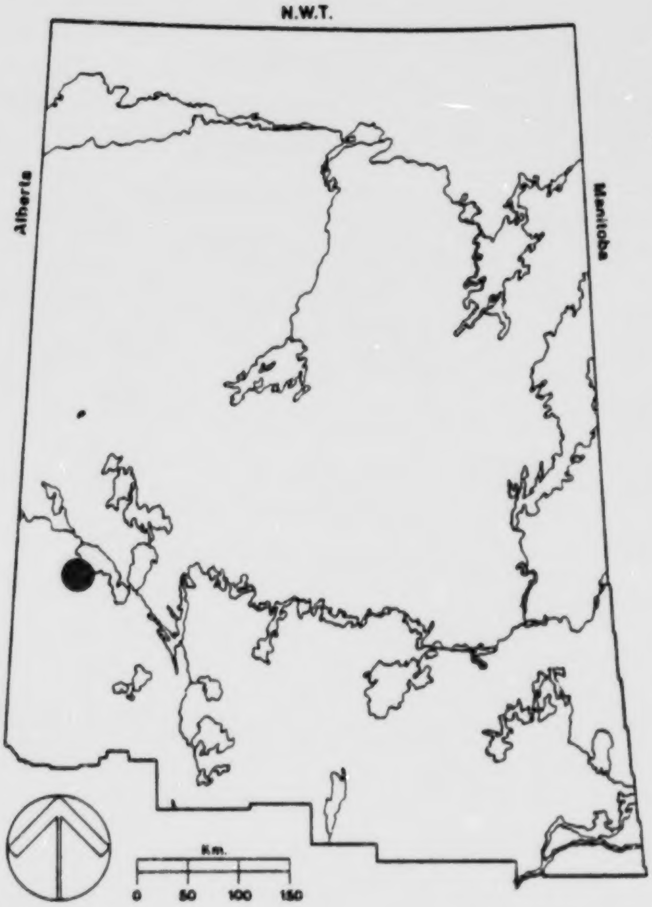
No data is available on the wind characteristics of this location. General observations of global wind patterns indicate that during the winter months, the dominant weather pattern of westerly flowing winds shift southward, subjecting northern areas of Saskatchewan to frequent periods of calm. These calm periods would severely affect the viability of a wind power system. Further investigation of the microclimate surrounding the community (including significant topographical features and specific site wind characteristics), would be required to establish the potential for wind power at this site.

Michel

REMOTE COMMUNITY ANALYSIS

I. COMMUNITY PROFILE

MICHEL VILLAGE



STATUS:

Local Advisory Council

L.A.C.

LOCATION:

Lat: 55°59'

Long: 109°06'

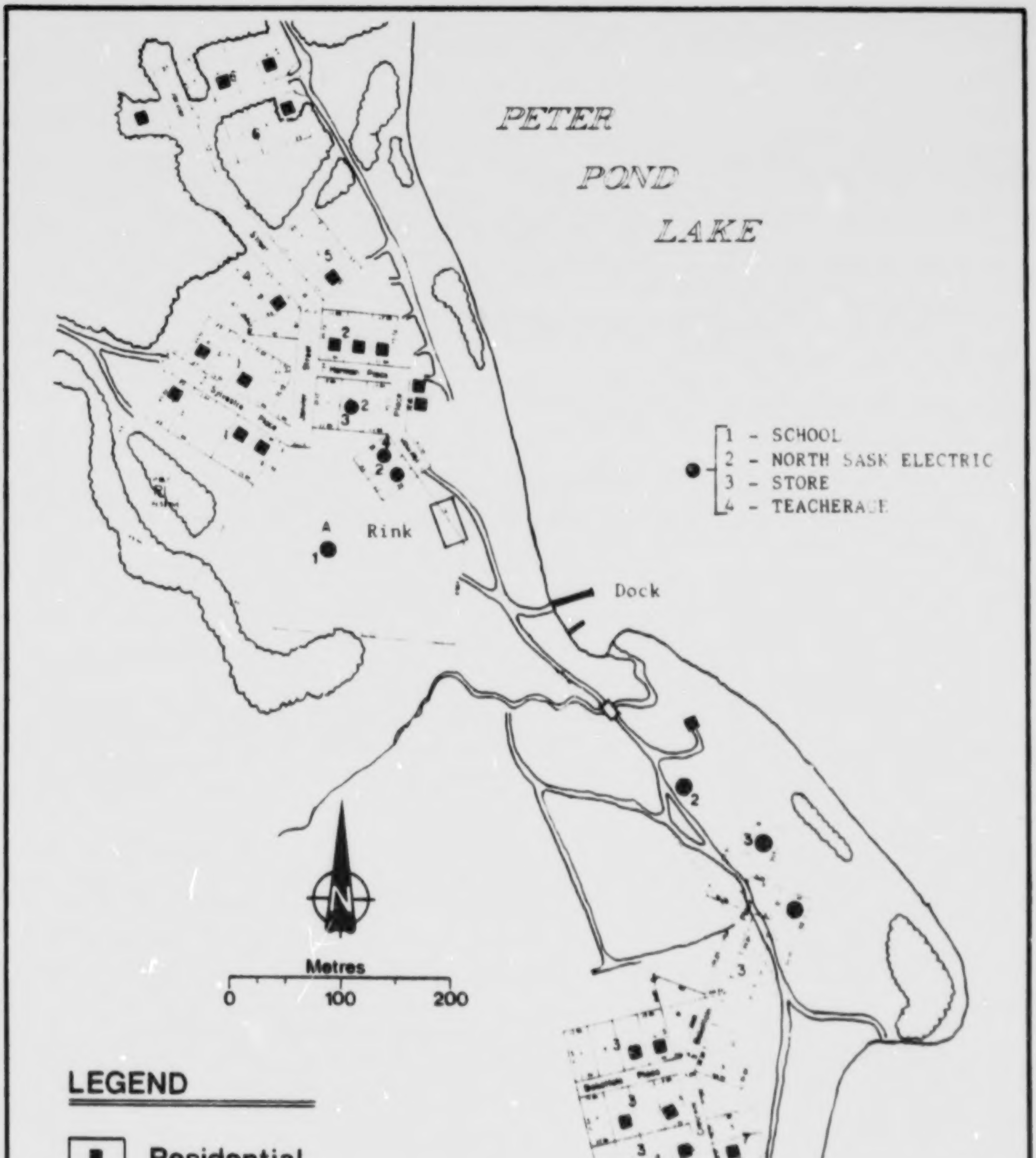
Source of Information:

Publications and Articles

Institute of Northern Studies settlements of Northern Saskatchewan, University of Saskatchewan, 1973.
Northern Saskatchewan Community Director, August 1981.

Interviews

Cal McLachlan, Manager, North-Sask Electric, La Ronge, January 1983.
Tom Fraser, DNS Community Planning, Prince Albert, January 1983.
Larry Evans, Manager, Sask Housing Corporation, Northern Department, January 1983.
Brian Ritchie, Capital Co-ordinator, Northern Lights School Division, January 1983.
Manager, Imperial Oil, Buffalo Narrows, February 1983.
Resource Office, Buffalo Narrows, February 1983.
Manager, Hudson's Bay, Dillon, February 1983.
Ken Skotheim, Manager, Canada Propane, Meadow Lake, February 1983.
Bruce Clark, Clarks Bus Service (propane dealer) Bufalo Narrows, February 1983.


PETER POND LAKE
1 - SCHOOL
2 - NORTH SASK ELECTRIC
3 - STORE
4 - TEACHERAGE
Rink
Dock
N
Metres
0
100
200
LEGEND
Residential
Institutional
Commercial
Industrial
Vegetation
Seasonal Road to Dillon
Michel

Source: 1:5000 Air Photo's June 81, DNS Community Planning Plan

A. HISTORY AND GROWTH

1. Community Established first survey plan registered 1975

2. Demographics:

Present Population 130 (1981) + Census Canada

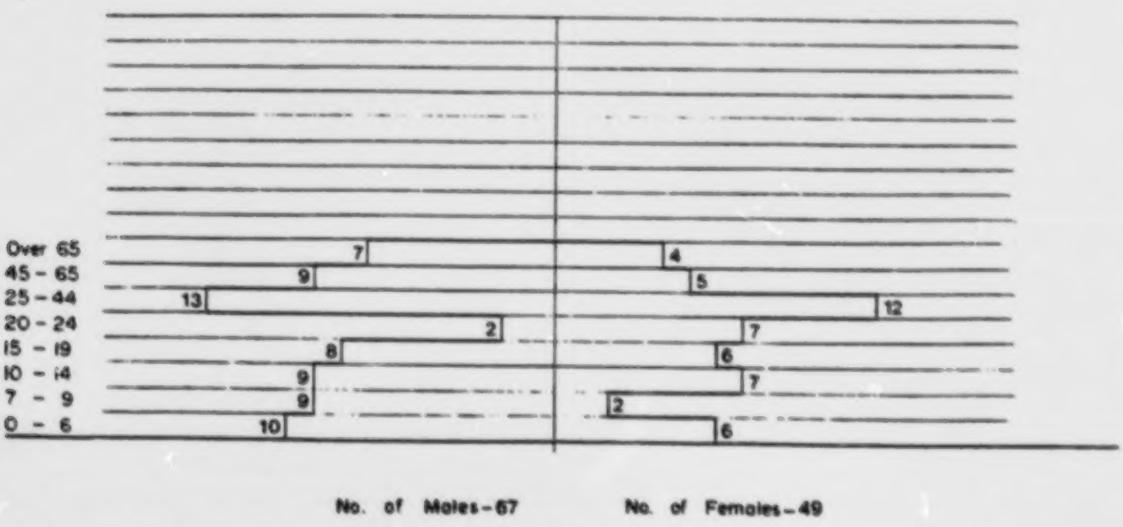
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total)			60						116	130	116

Growth % 3% per year - DNS Projection

Projected Future Population Growth 1985 - 134 persons; 1990 - 155; 1995 - 180.

Ethnic Mix: White ______%
Metis ______% } majority are Metis
(Chipewyan) Indian ______%
Other ______% ________________

Age-Sex Structure (1980 Municipal Census)



B. Community Services

1. Water

Source		Distribution		Serving		Treatment	
Lake	X	Pipe	X	Government Buildings	X	Sedimentation	X
Stream		Truck		Commercial Buildings		Filtration	X
Wells		Individual Systems		Residences		Chlorination	X
Other		None		Standpipes	X	Flouridation	
						None	

2. Sewage

Collection System		Serving		Disposal	
Pipe	X	Government Buildings	X	Lagoon	X
Truck		Commercial Buildings		Septic Tanks	
Individual Systems		Residences		Treatment Plant	
None				None	

3. Solid Waste Disposal

Garbage Collection Organized X Yes ____ No

Landfill Site Utilized X Yes ____ No

Other Methods of Disposal ____ Yes X No

4. Fire Protection Organized ____ Yes X No

Equipment Buffalo Narrows

5. Police Protection - R.C.M.P. X Yes ____ No

Patrolled from Buffalo Narrows

C. Community Facilities

1. Health

Clinic in Community X yes ___ no

Size of Facility Hospital $56m^2$

Outpost Hospital X yes ___ no

Served By Buffalo Narrows

Staff ___ Doctors X Nurse ___ Other

Nurse visits once a week.

2. Education

School located in community X yes ___ no -built 1978

Kindergarten - Grade 9 Size 706 sq. m. Classrooms 3 plus activity room, Home Economics and Industrial Arts.

Teacherages: Size ___ sq. m. 2 teachers, 2 native instructors, 30 students.

3. Residential

(1) Number of houses in community 24

(2) Number of houses with sewer and water 0% (teacherages)

(3) Number of houses with power hook-up 100%

(4) Housing condition: Good 21 DNS houses - 10/21 - 47% less than 5 years old.

Fair 11/21, 53% 5-9 years old Poor ___

(5) Number of houses constructed annually 2-4 yr. size $92.9m^2$-$102m^2$

(6) Heat Source oil/wood furnaces, oil furnaces or wood space heaters.

(7) Cooking wood and some propane.

(8) Housing construction notes: Since 1973 houses built with basement to CMHC standards. R24 walls, R40 ceilings, prior to 1973 houses were 2, 3, 4 bedroom 800-900 sq. ft. Now to standard plans 1000-1100 sq. ft. Cost $60,000.

Source: Larry Evans, Sask Housing Northern Division.

4. Community Buildings

	Type/Use	Size		Type/Use	Size
1.	North-Sask Electric	N/A	4.		
2.	Health Clinic	$56m^2$	5.		
3.			6.		

5. Other Institutional/Commercial/Industrial Facilities (private, etc.)

	Type/Use	Size		Type/Use	Size
1.	Grocery Store	$74.3m^2$	4.		
2.			5.		
3.			6.		

D. Economic Activities

Agriculture		Hunting	X	Trapping	X
Fishing	X	Mining		Transportation	
Forestry		Tourism		Service Centre	

Other __________

E. Communications and Transportation Links

(1) Post Office ____ yes X no serviced from Dillon

Television X yes ____ no source & no. of stations - CBC Channel 11, 2 satellite stations

Radio X yes ____ no source & no. of stations - CBC

Telephone X yes ____ no listed under Dillon

X individual ____ community

X local X long distance

High Frequency Radio ____ yes X no

operated by __________

F. Transportation Links

1. Access to Community by Scheduled Services

	Carrier	Frequency	Origin
Air			
Truck	seasonal road link to Dillon		
Bus			
Other			

2. Local Transportation for Visitors

Taxi ____ yes __X__ no ____

Rental Vehicles ____ yes __X__ no

Charter Aircraft ____ yes __X__ no ____ where/whom

3. Local Transportation - by Community

	Yes	No	Type
Boats	X		
Snowmobiles	X		
Cars	X		
Heavy Vehicles			information unavailable
Other			

G. Notes: Regarding historical growth of community.

Social composition and decision-making.
Past and future socio-economic trends.

Michel Village began as a scattered settlement of residents from off reserve locations north of Dillon. Under the proposed Act, this community will be incorporated as a northern hamlet. Scheduled for hook-up to Saskatchewan Power grid during 1983.

H.1

Diesel Electric Generation

1. Location: MICHEL VILLAGE [1]
2. Owner: North Sask Electric
3. Diesel Type: 1-50KW; 1-75KW

4.

Customers 1981	Number	1981 Consumption (KWH)
Residential	18	111,763
Commercial	-	-
Government	8	101,910
Street Lights	2	5,473
Total	28	219,146

Average Residential Consumption 517.4 kWh/Mo (1981)

Diesel Fuel:

	1981	1982	1983
Cost $	0.236	0.3064	0.2542
Annual Fuel Use Litres	124,710	137,180[2]	150,900[2]
KWh/litre fuel	1.75		-
Fuel cost increases over previous year (%)	+12.9	+29.8	-17.0

Fuel Storage Capacity

Peak Load 45 KW

Forecast Peak Loads:

1981 54 kW; 1982 60 kW; 1983 68 kW;

1984 78 kW; 1985 90 kW

Notes: [1] Source: North Sask Electric

[2] Estimate based on 10% fuel usage increase p.a.

H.2 ENERGY PROFILE - ANNUAL CONSUMPTION - MICHEL VILLAGE

	Annual Energy Consumption			
Classification	Electricity (MWH)	Fuel Oil $(x\ 10^3)L$	Propane $(x\ 10^2)L$	Wood (Cords)
Education	79	23	80	20
Health	6	2	8	--
Protection	--	--	--	--
Communications	26	--	--	--
Transport Services	--	--	--	--
Government	--	--	--	--
Community Services	6	--	--	--
Commercial	--	--	--	--
Residential	112	5	44	200
Total	229	30	132	220

H.3 ENERGY PROFILE - SOURCE FUEL CONSUMPTION

	Annual Source Fuel Consumption - Basis 1982 Facilities				
Classification	Electricity[1] (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	1,747	890	218	328	3,183
Health	133	77	22	--	232
Protection	--	--	--	--	--
Communications	575	--	--	--	575
Transport Services	--	--	--	--	--
Other Government	--	--	--	--	--
Community Services	133	--	--	--	133
Commercial	--	--	--	--	--
Residential	2,477	194	120	3,280	6,071
Total	5,065	1,161	360	3,608	10,194

1. Lists the consumption of source fuel (usually fuel oil) required to generate electrical energy, and uses an average performance index of 1.75 kwh/litre of fuel.

I. ASSESSMENT OF RESOURCES: MICHEL VILLAGE

1.0 POTENTIAL SMALL SCALE HYDRO ELECTRIC SITES

1.1 Background

There appears to be no significant topographical or hydrological features within a 16 km radius that would indicate potential for small scale hydro-electric development. Given the proximity of this community to Dillon, (15 km), it may have an opportunity to utilize power from a potential hydro-electric site identified approximately 16 km south of Dillon. Refer to the assessment of hydro-electric potential for Dillon.

1.2 Sites Within a 16 km Radius

None.

2.0 WOOD RESOURCES

Research undertaken by Saskatchewan Power Corporation indicates that standing wood reserves within a 19 km radius of the Michel-Dillon area total 1.2 million cords. About 52% of this reserve are hardwoods, (aspen and birch), and 48% are softwoods, (jackpine, black spruce and white spruce).

In terms of forest maturity, the reserve is broken down as follows:

	Softwoods	Hardwoods
10 - 18 cm diameter class	55%	42%
20 - 23 cm diameter class	17%	20%
25 + diameter class	28%	38%

Estimated additional biomass volume, available from foliage and tops, has been estimated by Saskatchewan Power Corporation and is illustrated below.

Foliage: 94,000 - 187,000 cords
Tops: 70,000 - 152,000 cords

The only forest related industry in the area is a small sawmill located in Dillon and operated by the Department of Indian and Northern Affairs to supply local building materials.

Saskatchewan Power Corporation has concluded that a more than sufficient supply of wood exists to supply feedstock for a local power/gasification plant in addition to the demand for wood that currently exists in the community. It has been estimated that a gasification plant for local power generation would consume 89,000 cords over a 50 year period.

The majority of residential fuelwood is used in very inexpensive tin woodstoves for home heating. Fuelwood is usually burned green within 2-3 weeks of harvest.

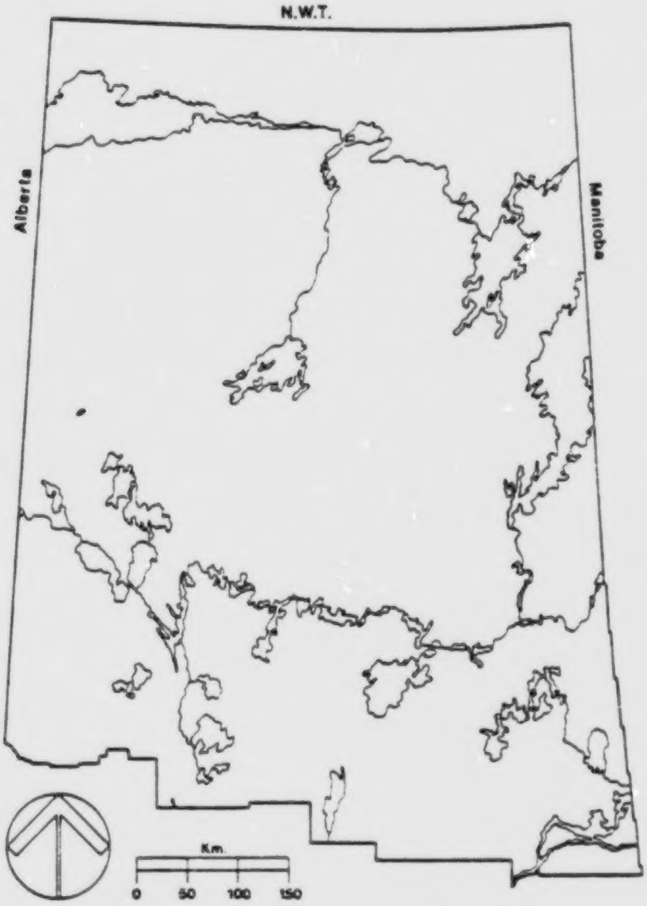
3.0 WIND RESOURCES

Very little data is available on wind characteristics for the community of Michel Village. However, Environment Canada has recently set up a wind monitoring station in Buffalo Narrows. Unfortunately, a solid base of historical wind data does not yet exist.

Generally speaking, the potential for wind as a source of power for electrical generation in northern Saskatchewan is questionable, due to the frequent occurrences of calm. Further information on the microclimate, (including significant topographical features), and specific site wind measurements surrounding Michel, would be necessary to determine wind potential.

Patuanak

REMOTE COMMUNITY ANALYSIS



I. COMMUNITY PROFILE

PATUANAK

STATUS:

Local Advisory Council

LAC & Indian Reserve 192D

(English River Band)

LOCATION:

Lat: 55° 55'

Long: 107° 43'

Located adjacent to the
Shagwenaw Rapids on
Churchill River

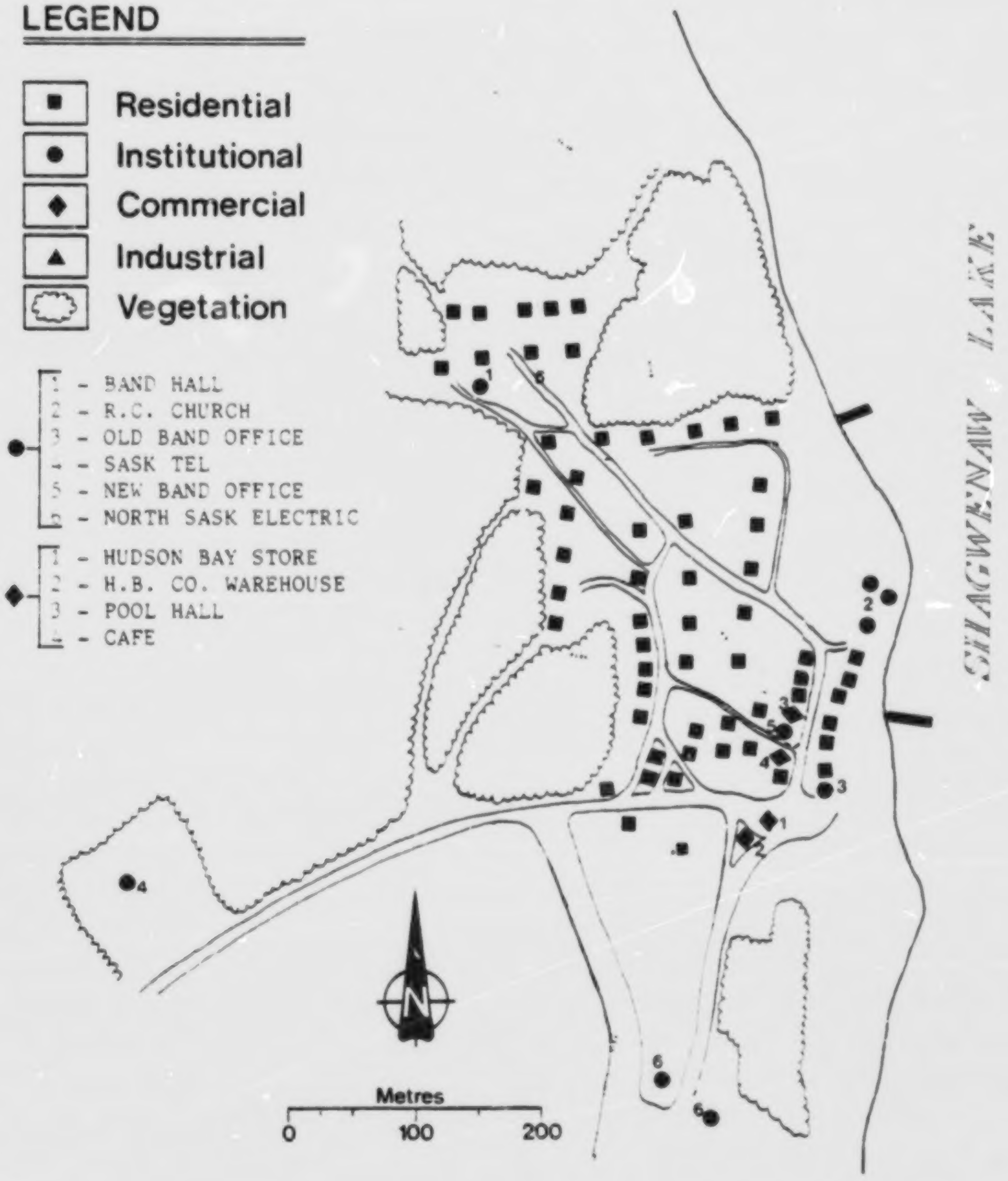
Source of Information:

Publications and Articles

Northern Saskatchewan Community Directory, August 1981.
Institute of Northern Studies, Settlements of Northern Sask.
Rieber/Kremers & Associates, Patuanak, English River, 1979.
Denosa "Patuanak's Frank McIntyre" June 1982, p. 20125.

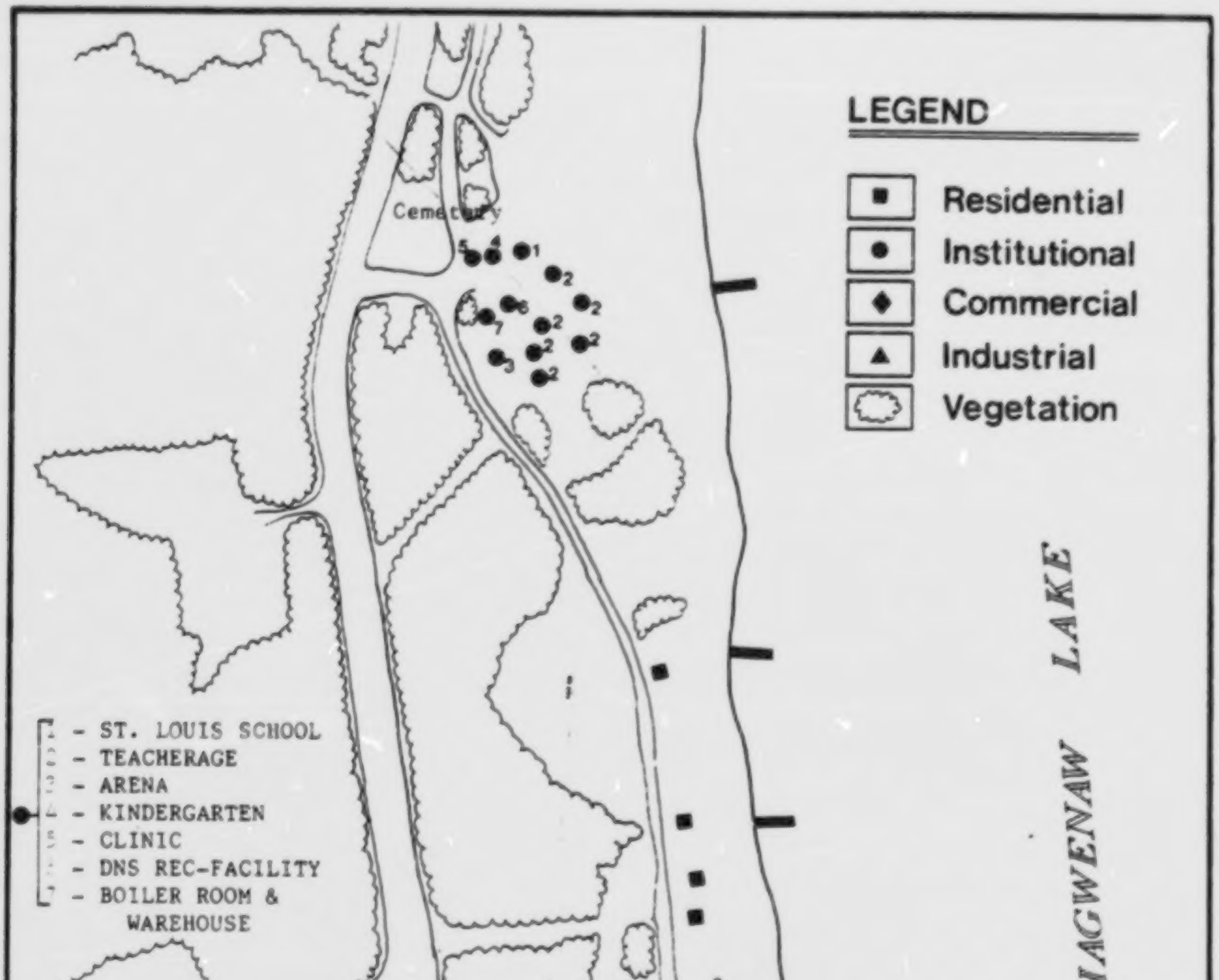
Interviews and Correspondence

Henry Nicholas, D.I.A.N.D., Meadow Lake District Office, February 1983.
Cal McLachlan, Manager, North Sask Electric Ltd., La Ronge, January 1983.
Brian Ritchie, Capital Co-ordinator, Northern Lights School Division, Prince Albert, January 1983.
Larry Evans, Manager, Sask Housing Corp., Northern Department, January 1983.
Len Odgen, Manager, Hudson Bay, Patuanak, February 1983.
Etienne Black, Manager, Texaco Service Station, Patuanak, February 1983.
Ken Skotheim, Meadow Lake Propane, February 1983.
Manager, Gulf Oil, Meadow Lake, February 1983.


LEGEND
■ Residential
● Institutional
◆ Commercial
▲ Industrial
Vegetation
1 - BAND HALL
2 - R.C. CHURCH
3 - OLD BAND OFFICE
4 - SASK TEL
5 - NEW BAND OFFICE
6 - NORTH SASK ELECTRIC
1 - HUDSON BAY STORE
2 - H.B. CO. WAREHOUSE
3 - POOL HALL
4 - CAFE
SHAGWENAW LAKE
N
Metres
0
100
200

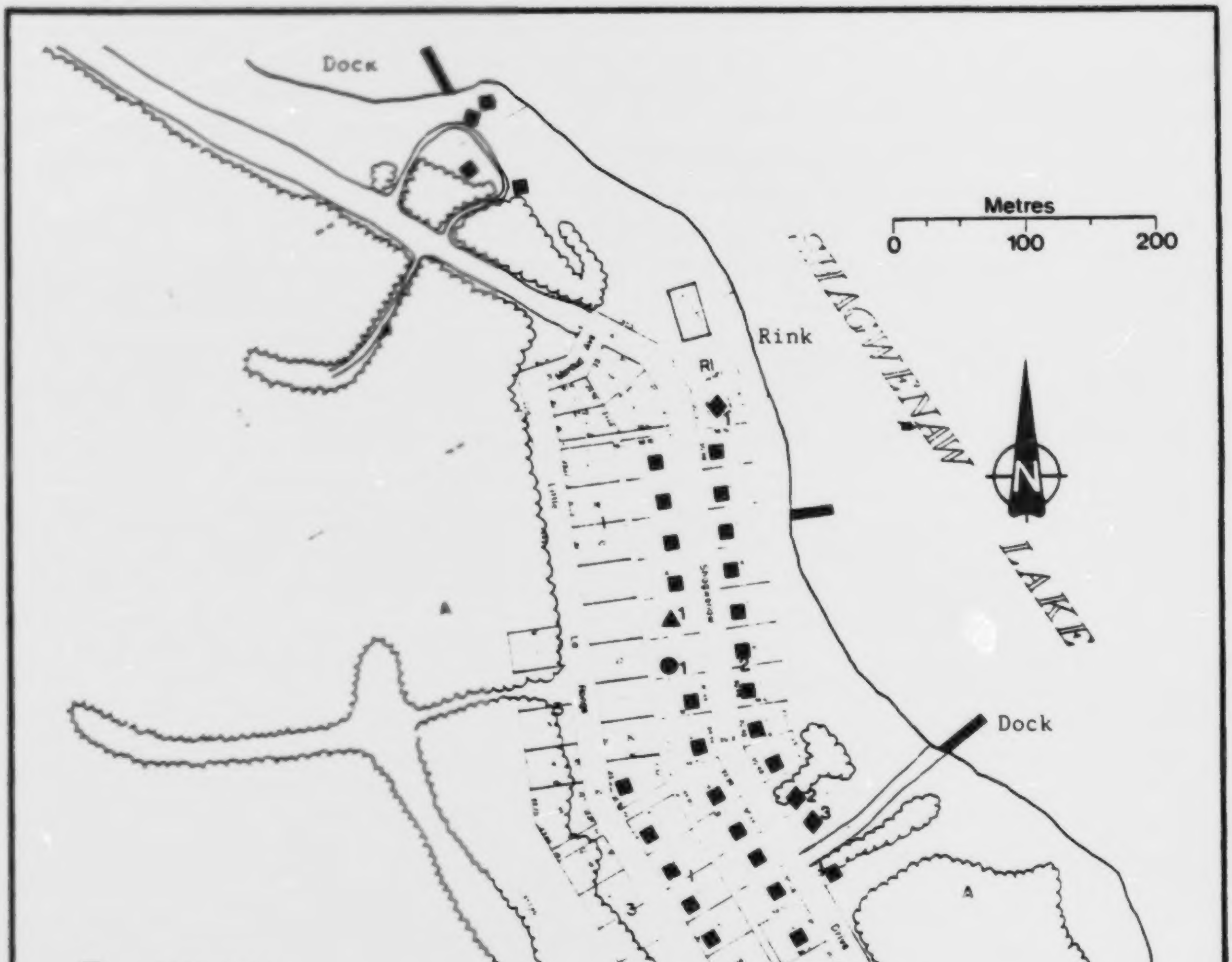
Patuanak (a)

SOURCE: 1:5000 AIR PHOTO'S 1979 RECKER KREMUS COMMUNITY PLANNING STUDY 1979


LEGEND
■ Residential
● Institutional
◆ Commercial
▲ Industrial
Vegetation
Cemetary
SHAGWENAW LAKE
1 - ST. LOUIS SCHOOL
2 - TEACHERAGE
3 - ARENA
4 - KINDERGARTEN
5 - CLINIC
6 - DNS REC-FACILITY
7 - BOILER ROOM & WAREHOUSE
N
Metres
0
100
200

Patuanak (b)

Source: 1:5000 Air Photo's June 81, DNS Community Planning Plan 86


Dock
Rink
SHAGUENNAW LAKE
Metres
0
100
200
N
Dock
A
A
1 - POOL HALL
2 - STORE
3 - SHAGUENNAW TEXACO SERVICE STATION
LEGEND
Residential
Institutional
Commercial
Industrial
Vegetation

Patuanak (c)

Source: 1:5000 Air Photo's June 1981, DNS Community Planning Plans

A. HISTORY AND GROWTH — Indian Reserve

The English River Band has six reserves Elak Dase I.R. 192A, Knee Lake

1. Community Established — I.R. 192B, Dipper Rapids I.R. 192C, Wapot Vanak I.R. 192D, Ile a la Crosse

2. Demographics: — I.R. 192E, & La Plonge I.R. 192. Patuanak is the main community of I.R. 192D

Present Population — Highly mobile but approximately 425 in 1982 on the reserve.

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (On reserve)						385			487	507	498

Total 431 on reserve

Growth % — 2.5% (DIAND statistics)

Projected Future Population Growth on Reserve 1989 - 467 persons, 1994 - 494 (Rieter Kremers - Community Planning Study)

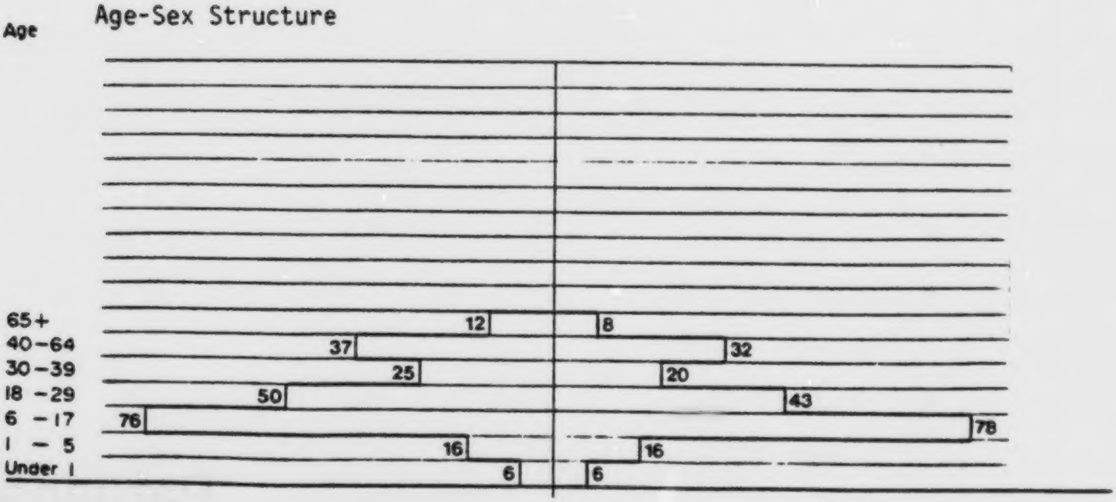
Ethnic Mix: White ______ %

Metis ______ %

Indian 100 % (Chipewyan)

Other ______ % ______________________

Age-Sex Structure



No. of Males-222 No. of Females-203

A. HISTORY AND GROWTH

L.A.C.

1. Community Established: As a mission about 1916. As a more permanent settlement in 1968 with the construction of a school.

2. Demographics:

Present Population 180

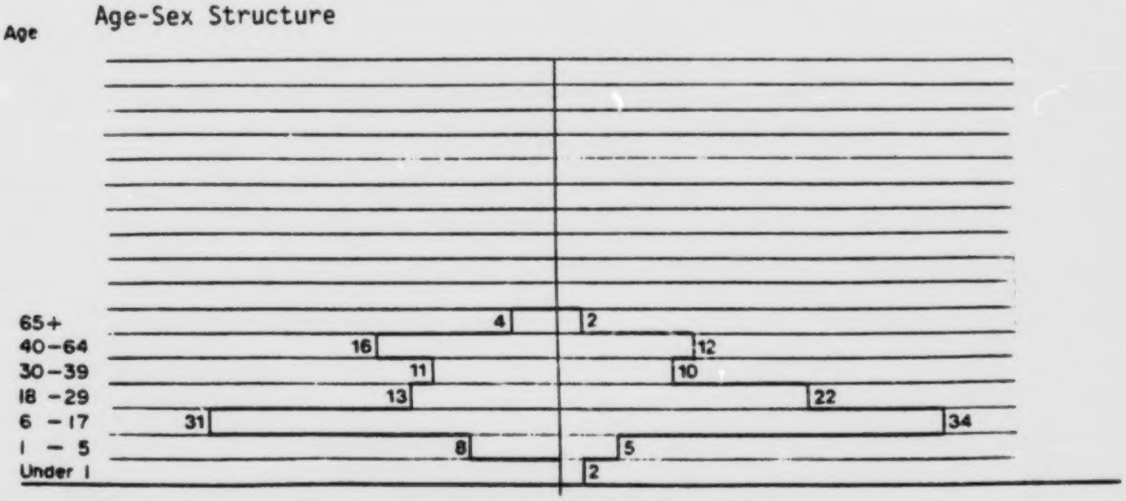
Source: Community profile - H & WC Medical Services, 1982

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total)								196	183	192	180
Growth %											

Projected Future Population Growth @ 2% 1986 - 211 persons, 1991 - 234, 1996 - 258

Ethnic Mix: White ____% } majority Metis
Metis ____% }
Indian ____%
Other ____% ________________

Age-Sex Structure



No. of Males-83 No. of Females-87

B. Community Services (L.A.C. & Reserve)

1. Water

Source		Distribution		Serving		Treatment	
Lake	X	Pipe		Government Buildings	X	Sedimentation	
Stream		Truck		Commercial Buildings	X	Filtration	
Wells	X	Individual Systems	X	Residences		Chlorination	
Other		None		Standpipes		Flouridation	
						None	X

2. Sewage

Collection System		Serving		Disposal	
Pipe		Government Buildings	X	Lagoon	
Truck		Commercial Buildings	X	Septic Tanks	X
Individual Systems	X	Residences		Treatment Plant	
None				None	

3. Solid Waste Disposal

Garbage Collection Organized		Yes	X	No
Landfill Site Utilized		Yes	X	No
Other Methods of Disposal		Yes	X	No

4. Fire Protection Organized ____ Yes __X__ No

Equipment Plan for fire hall and equipment

5. Police Protection - R.C.M.P. __X__ Yes ____ No

Patrolled from Ile-a-la-Crosse

C. Community Facilities (L.A.C. & Reserve)

1. Health

Clinic in Community X yes _____ no

Size of Facility Hospital in school

Outpost Hospital X yes _____ no

Served By _____

1 Community Health Workers 1 DIAND, 1 DNS

Staff _____ Doctors 4 Nurse _____ Other

Doctor visits 2 x month, nurse 2 x per week, Ile-a-la-Crosse

2. Education

School located in community X yes _____ no

Kindergarten - Grade 9 Size 312 sq. m. Classrooms 4 + library,

165 students clinic

Teacherages: Size _____ sq. m. 5 teacherages, 18 teachers, 2 teacher aide

3. Residential (Reserve)

(1) Number of houses in community 68+

(2) Number of houses with sewer and water 0%

(3) Number of houses with power hook-up 100%

(4) Housing condition: Good _____

Fair 40% Poor 60%

(5) Number of houses constructed annually 2 - 4 size 7.3m^2 - 9.7m

(6) Heat Source Wood space heaters/oil furnaces/wood/oil furnaces

(7) Cooking _____

(8) Housing construction notes: Standard DIAND House

Construction since 1982, size 7.3m x 9.7m; walls - 2 x 6 - R20;

Ceilings - R40; Floors - R20

C. Community Facilities

1. Health (on previous page)

Clinic in Community ______ yes ______ no

Size of Facility Hospital ______

Outpost Hospital ______ yes ______ no

Served By ____

Staff ____ Doctors _____ Nurse ____________ Other

____

2. Education (on previous page)

School located in community ______ yes ______ no

Kindergarten - Grade 9 Size ______ sq. m. Classrooms ______

Teacherages: Size ______ sq. m. ________________________

3. Residential L.A.C.

(1) Number of houses in community 28^+

(2) Number of houses with sewer and water 0%

(3) Number of houses with power hook-up 100%

(4) Housing condition: Good 8/21 38% less than 5 years old

Fair 13/21 (62%) 6-8 yrs. old Poor ______________

(5) Number of houses constructed annually 2-3 units Size $92.9m^2$-$102m^2$

(6) Heat Source wood/oil/ furnaces or oil furnaces, also space heaters

(7) Cooking ____

(8) Housing construction notes: Since 1973 houses built with basement to CMHC standards. R24 walls, R40 ceilings, prior to 173 houses were 2, 3, 4 bedroom 800-900 sq. ft. Now to standard plans 1000-1100 sq. ft. Cost $60,000.

Source: Larry Evans, Sask Housing Northern Division

4. Community Buildings L.A.C. & Reserve

Type/Use	Size	Type/Use	Size
1. Arena		5. Clinic	
2. DNS Rec-Facility		6. Kingergarten	
3. Boiler Room & Warehouse		7. Band Hall (old)	
4. Airstrip Shelter	$19.3m^2$	8. Band Office (new)	

5. Other Institutional/Commercial/Industrial Facilities (private, etc.)

Type/Use	Size	Type/Use	Size
1. R.C. Church		4. Pool Hall	
2. Sask Tel		5. Cafe	
3. North Sask Electric		6. Store	
4. Hudson Bay Store		Service Station	

D. Economic Activities

Agriculture		Hunting	X	Trapping	X
Fishing	X	Mining	Cluff Lake	Transportation	
Forestry		Tourism		Service Centre	X

Other handicrafts

E. Communications and Transportation Links

(1) Post Office X yes ____ no

Television X yes ____ no

Radio X yes ____ no

Telephone X yes ____ no

X individual ____ community

X local X long distance

High Frequency Radio ____ yes ____ no } information not available

operated by ____________

F. Transportation Links

1. Access to Community by Scheduled Services

	Carrier	Frequency	Origin
Air	Charter - 3,000 ft. gravel airstrip		
Truck	Road access provided 1976 via Highway #155		
Bus			
Other			

2. Local Transportation for Visitors

Taxi __X__ yes _____ no

Rental Vehicles _____ yes __X__ no

Charter Aircraft _____ yes __X__ no where/whom

3. Local Transportation - by Community

	Yes	No	Type
Boats (wooden skiffs)	X		
Snowmobiles	X		
Cars	X		
Heavy Vehicles			information unavailable
Other			

G. Notes: Regarding historical growth of community.
Social composition and decision-making.
Past and future socio-economic trends.

Patuanak provides the majority of Northern Labour at the Cluff Lake Mine as well as at Key Lake.

Under the proposed Act, Patuanak will become incorporated as a northern hamlet.

Scheduled for hook-up to Saskatchewan Power grid during 1983.

H.1

Diesel Electric Generation

1. Location: PATUANAK[1]
2. Owner: North Sask Electric
3. Diesel Type: 2-250 KW; 1-150 KW

4.

Customers 1981	Number	1981 Consumption (KWH)
Residential	101	449,280
Commercial	9	93,250
Government	10	135,195
Street Lights	4	19,814
Total	124	696,427

Average Residential Consumption 370.7 kWh/Mo (1981)

Diesel Fuel:

	1981	1982	1983
Cost $	.264	.283	.2522
Annual Fuel Use Litres	298,081	327900[2]	360,700[2]
KWh/litre fuel	2.34		
Fuel cost increases over previous year (%)	+29.	+7.2	-10.9

Fuel Storage Capacity 3 x 22,730 = 68,190 litres

Peak Load 200 KW

Forecast Peak Loads:

1981 212 kW; 1982 250 kW; 1983 275 kW;

1984 305 kW; 1985 380 kW

Notes:

[2] Source: North Sask Electric

[2] Estimate based on 10% fuel usage increase p.a.

H.2 ENERGY PROFILE - ANNUAL CONSUMPTION - PATUANAK

	Annual Energy Consumption			
Classification	Electricity (MWH)	Fuel Oil (x 10^3)L	Propane (x 10^2)L	Wood (Cords)
Education	225	142	72	--
Health*	--	--	--	--
Protection	1	1	--	--
Communications	109	--	--	--
Transport Services	--	--	--	--
Government	--	--	--	--
Community Services	40	22	--	--
Commercial	100	25	10	10
Residential	450	72	--	500
Total	925	262	82	510

---

*Health facility located in school.

H.3 ENERGY PROFILE - SOURCE FUEL CONSUMPTION

	Annual Source Fuel Consumption - Basis 1982 Facilities				
Classification	Electricity[1] (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	3,721	5,495	196		9,412
Health*	--	--	--	--	--
Protection	17	39		--	56
Communications	1,083	--		--	1,083
Transport Services	--	--	--	--	--
Government	--	--	--	--	--
Community Services	662	851	--	--	1,513
Commercial	1,654	968	27	164	2,813
Residential	7,442	2,786	--	8,200	18,428
Total	14,579	10,139	223	8,364	33,305

*Health facility in school.

I. ASSESSMENT OF RESOURCES: PATUANAK

1.0 POTENTIAL SMALL SCALE HYDRO ELECTRIC SITES

1.1 Background

Three potential hydro-electric sites have been identified within close proximity of the community of Patuanak. All three sites are located on the Churchill River.

1.2 Sites Within a 16 km Radius

Shagwenaw Rapids - This site is located about 1 km north of the community of Patuanak, where Lac Ile a la Crosse flows into Shagewnaw Lake. Head available is approximately 1m. A water gauge station located at the site indicates a minimum average flow of 125 m^3/s. Given the low laying nature of the land in the vicinity, and the close proximity of the site to the community, damming of the waterflow to increase head may be unfeasible. Considering the present head available and a hydro electric generating system efficiency of 50%, a firm generating capacity of 600 kw may be available.

Drum Rapids, Leaf Rapids - Both of these locations are located about 11 km northwest of the community of Patuanak. Approximately 5 m of head appears available.

Based on a minimum daily river flow (measured at Patuanak) of (125 m^3/s), a firm generating capacity of 3 MW can be estimated for this location, assuming a 50% generating efficiency.

2.0 WOOD RESERVES

According to the Saskatchewan Power Corporation, the standing wood reserves within a 19 km radius of Patuanak amount to about 1.1 million cords. Hardwoods make up about 21% of this reserve and softwoods, the remainder. Major species found in the area include jackpine, black spruce, aspen and birch.

In terms of maturity of size, the forest is broken down as follows:

	Softwoods	Hardwoods
10-18 cm diameter class	73%	58%
20-23 cm diameter class	--	--
25 + diameter class	--	--

The high proportion of small size growth can be attributed to the frequent number of fires that have occurred in the area.

Estimated additional biomass volumes available from foliage and tops has been estimated by Saskatchewan Power Corporation as follows:

Foliage:	86,000 - 171,000 cords
Tops:	64,000 - 139,000 cords

Wood collection in the community is unorganized and harvested on a individual basis. Wood is generally burned within 2-3 weeks of the time it is harvested.

The majority of residents burn wood in inexpensive fabricated tin stoves.

A Department of Northern Saskatchewan sawmill is located in the community, but has not been in use for the past five years.

3.0 WIND RESOURCES

No data is currently available on wind characteristics in the area of Patuanak. However, the Department of the Environment has recently established a monitoring station in Buffalo Narrows. Unfortunately a solid base of histroical data does not yet exist.

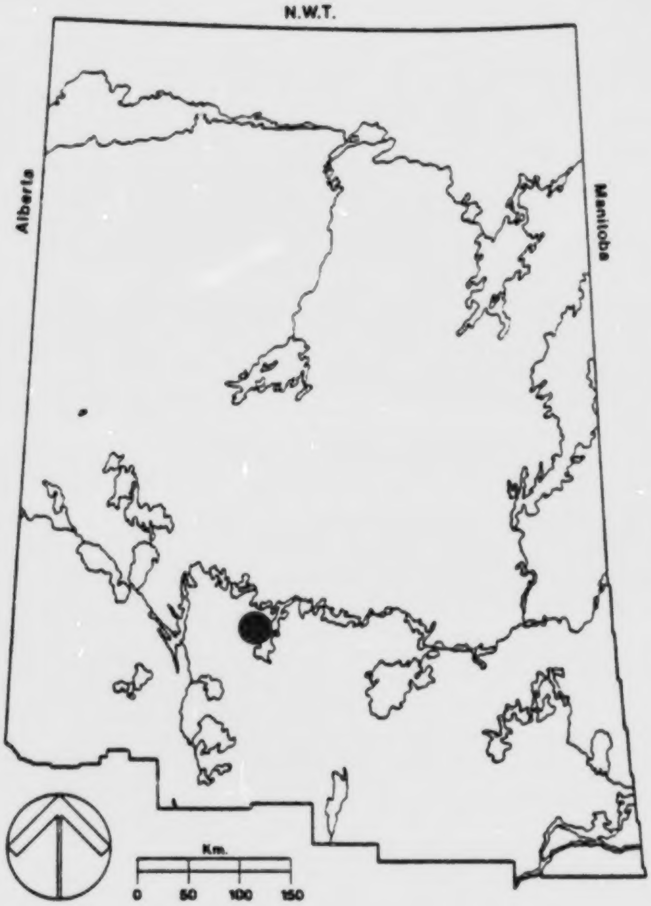
Generally speaking, the potential for wind, as a source of power for electrical generation in northern Saskatchewan, is questionable, due to the high frequency of calm periods occurring during winter months. Further investigation of the microclimate surrounding Patuanak, (including significant topographical features and specific site wind characteristics), would be required to establish the potential for wind at this site.

Pinehouse

REMOTE COMMUNITY ANALYSIS

I. COMMUNITY PROFILE

PINEHOUSE



STATUS:

Local Community Authority

L.C.A.

LOCATION:

Lat: 55° 31'

Long: 106° 36'

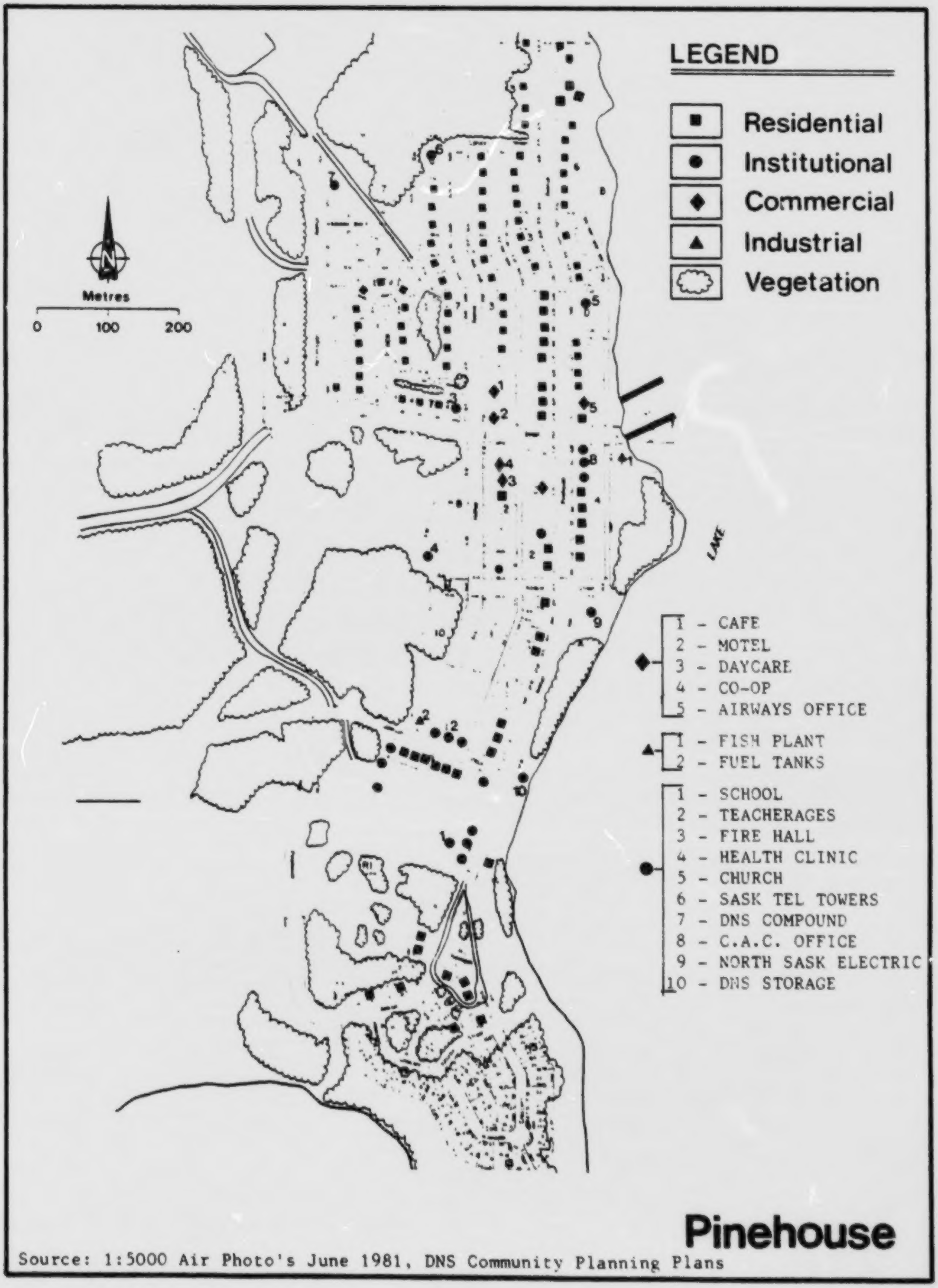
Source of Information:

Publications and Articles

Northern Saskatchewan Community Directory, August 1981.
"Saskatchewan Hospitals Service Plan" - Saskatchewan Health, 1974-82.
Institute of Northern Studies, Settlements of Northern Sask.
Denosa, "Minahikw Waskahigan" June 82, p. 10, 11.
Underwood McLellan Ltd., "Pinehouse Community Development Plan" 1981.

Interviews and Correspondence

Tom Fraser, DNS Community Planning, Prince Albert, January 1983.
Cal McLachlan, Manager, North Sask Electric Ltd., La Ronge, January 1983.
Brian Ritchie, Capital Co-ordinator, Northern Lights School Division, Prince Albert, January 1983.
Larry Evans, Manager, Sask Housing Corp., Northern Department, January 1983.
L.A.C. Office, Pinehouse, February 1983.
Van Skogskad, Pinehouse Co-op, February 1983.
Pinehouse Airway, February 1983.
Resource Officer, Pinehouse, February 1983.


LEGEND
■ Residential
● Institutional
◆ Commercial
▲ Industrial
Vegetation
N
Metres
0
100
200
LAKE

◆
1 - CAFE
2 - MOTEL
3 - DAYCARE
4 - CO-OP
5 - AIRWAYS OFFICE

▲
1 - FISH PLANT
2 - FUEL TANKS

●
1 - SCHOOL
2 - TEACHERAGES
3 - FIRE HALL
4 - HEALTH CLINIC
5 - CHURCH
6 - SASK TEL TOWERS
7 - DNS COMPOUND
8 - C.A.C. OFFICE
9 - NORTH SASK ELECTRIC
10 - DNS STORAGE

Pinehouse

Source: 1:5000 Air Photo's June 1981, DNS Community Planning Plans

A. HISTORY AND GROWTH

1. Community Established 1899 - R.C. Mission established at this site. 1944 - Church finally constructed on the site.

2. Demographics:

Present Population 648

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total)	509	488	508	530	538	525	546	563	594	631	648

Growth % 2.59%

Projected Future Population Growth @ 2.5% 1986 - 713 persons 1991 - 807, 1996 - 913 from DNS Community Planning Statistics

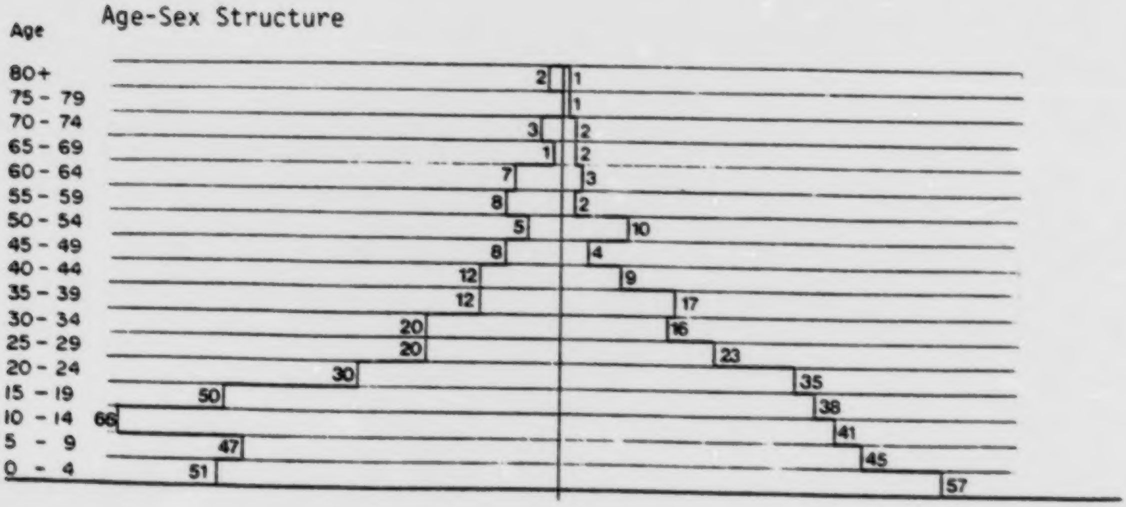
Ethnic Mix: White ______% } majority Metis

Metis ______% }

Indian (Cree) ______%

Other ______% ____________________

Age-Sex Structure



No. of Males-342 No. of Females-306

B. Community Services

1. Water

Source		Distribution		Serving		Treatment	
Lake	X	Pipe	X	Government Buildings	X	Sedimentation	
Stream		Truck		Commercial Buildings	X	Filtration	X
Wells	X	Individual Systems	X	Residences	X	Chlorination	X
Other		None		Standpipes		Flouridation	
						None	

2. Sewage

Collection System		Serving		Disposal	
Pipe	X	Government Buildings	X	Lagoon	X
Truck		Commercial Buildings	X	Septic Tanks	X
Individual Systems	X	Residences	X	Treatment Plant	
None				None	

3. Solid Waste Disposal

Garbage Collection Organized X Yes ____ No
Landfill Site Utilized X Yes ____ No
Other Methods of Disposal ____ Yes ____ No

4. Fire Protection Organized X Yes ____ No

Equipment truck

5. Police Protection - R.C.M.P. X Yes ____ No

Patrolled from La Ronge

C. Community Facilities

1. Health

Clinic in Community X yes ____ no

Size of Facility Hospital 428m^2

Outpost Hospital ____ yes X no

Served By ____________

Staff ____ Doctors 2 Nurse ________ Other

Doctors make weekly visits

2. Education

School located in community X yes ____ no

Built 1980 New gymnasiu
& Rec Centre 1982,
Science room, Home Ec.
Industrial Arts and Library

Kindergarten - Grade 9 Size 2972 sq. m. Classrooms 8

Teacherages: Size - sq. m. 1 duplex, 3/2 bedroom houses, 1/2 bedroom cottage, 1/1 bedrm cottage, 1/2 bedrm trailer

3. Residential

(1) Number of houses in community 79$^+$

(2) Number of houses with sewer and water 70% has a municipal system except for 1 sub. that can't be serviced.

(3) Number of houses with power hook-up 100%

(4) Housing condition: Good 32/79, 40.5% less than 5 years old,
Fair 27/79, 34% 5-10 years old Poor 20/79, 25% pre 1973.

(5) Number of houses constructed annually 2-3 units Size 929m^2-102m^2

(6) Heat Source wood/oil furnaces or oil furnaces, also space heaters

(7) Cooking wood

(8) Housing construction notes: Since 1973 houses built with basement to CMHC standards. R24 walls, R40 ceilings, prior to 1973 houses were 2, [illegible], 4 bedroom 800-900 sq. ft. Now to standard plans 1000-1100 sq. ft. Cost $60,000. 15/79 houses built by Local Housing Group. 64 supplied by DNS.

Source: Larry Evans, Sask Housing Northern Division.

4. Community Buildings

Type/Use	Size	Type/Use	Size
1. L.A.C. and Community Building	1040m^2	4. Day Care	N/A
2. Pinehouse Co-op General Store	N/A	5. Dept. of Highways Workshop	253.6m^2
3. Ice House		6. Airstrip Shelter	19.3m^2

5. Other Institutional/Commercial/Industrial Facilities (private, etc.)

Type/Use	Size	Type/Use	Size
1. Tinker's Cafe & Motel	N/A	5. DNS Resources Office	N/A
2. Hansen's Inn	N/A	6. DNS Social Services	N/A
3. Predco Dev. Corporation		7. DNS Sewer & Water	50m^2
4. Firehall	74m^2	8. Church	167m^2

D. Economic Activities

Agriculture		Hunting	X	Trapping	X
Fishing	X	Mining		Transportation	X
Forestry		Tourism		Service Centre	

Other ______

E. Communications and Transportation Links

(1) Post Office X yes ___ no

Television X yes ___ no

Radio X yes ___ no

Telephone X yes ___ no Sask Tel

X individual ___ community

X local X long distance

High Frequency Radio ___ yes ___ no

operated by ______ (information not available)

F. Transportation Links

1. Access to Community by Scheduled Services

	Carrier	Frequency	Origin
Air	Charter Services	3000' gravel	Airstrip
Truck	Direct access via	Highway #2	
Bus			
Other			

2. Local Transportation for Visitors

Taxi X yes no

Rental Vehicles yes X no

Charter Aircraft X yes no where/whom (Pinehouse Airways)

3. Local Transportation - by Community

	Yes	No	Type
Boats	X		
Snowmobiles	X		
Cars	X		
Heavy Vehicles			information unavailable
Other			

G. Notes: Regarding historical growth of community.
Social composition and decision-making.
Past and future socio-economic trends.

Many problems associated with house construction and longevity of DNS housing in the community.

Pinehouse scheduled for hook-up to Saskatchewan Power grid 1983.

H.1

Diesel Electric Generation

1. Location: PINEHOUSE LAKE [1]
2. Owner: North Sask Electric
3. Diesel Type: 2-250 KW; 2-600 KW

4.

Customers 1981	Number	1981 Consumption (KWH)
Residential	88	501,869
Commercial	15	151,980
Government	17	426,174
Street Lights	1	29,330
Total	121	1,109,353

Average Residential Consumption 475.2 kWh/Mo (1981)

Diesel Fuel:

	1981	1982	1983
Cost $	0.271	0.2834	0.2502
Annual Fuel Use Litres	410,760	451,840[2]	497,020[2]
KWh/litre fuel	2.7		
Fuel cost increases over previous year (%)	+35.5	+4.6	-11.7

Fuel Storage Capacity 6 x 22730 = 136,380 litres

Peak Load 200 KW

Forecast Peak Loads:

1981 300 kW; 1982 330 kW; 1983 365 kW;

1984 405 kW; 1985 450 kW

Notes: [1] Source: North Sask Electric

H.2 ENERGY PROFILE - ANNUAL CONSUMPTION - PINEHOUSE

	Annual Energy Consumption			
Classification	Electricity (MWH)	Fuel Oil $(x\ 10^3)^L$	Propane $(x\ 10^2)^L$	Wood (Cords)
Education	254	138	150	--
Health	10	8	10	--
Protection	16	--	175	--
Communications	110	--	--	--
Transport Services	--	--	--	--
Government	35	20	82	--
Community Services	150	40	33	10
Commercial	155	95	10	20
Residential	502	117	55	700
Total	1,232	418	515	730

H.3 ENERGY PROFILE - SOURCE FUEL CONSUMPTION

Classification	Annual Source Fuel Consumption - Basis 1982 Facilities				
	Electricity[1] (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	3,641	5,341	408	--	9,390
Health	143	310	27	--	480
Protection	229	--	476	--	705
Communications	1,577	--	--	--	1,577
Transport Services	--	--	--	--	--
Government	502	774	223	--	1,499
Community Services	2,150	1,548	90	164	3,952
Commercial	2,222	3,677	27	328	6,254
Residential	7,195	4,528	150	11,480	23,353
Total	17,659	16,178	1,401	11,972	47,210

1. Lists the consumption of source fuel (usually fuel oil) required to generate electrical energy, and uses an average performance index of 2.7 kwh/litre of fuel.

I. ASSESSMENT OF RESOURCES: PINEHOUSE

1.0 POTENTIAL SMALL SCALE HYDRO ELECTRIC SITES

1.1 Background

Pinehouse is located on Pinehouse Lake, which is part of the Churchill River system. No significant hydro-electric sites were identified within a 16 km radius of the community. One potential site was identified beyond the study area.

1.2 Sites Within a 16 km Radius

None.

1.3 Potential Sites Beyond a 16 km Radius

Snake Rapids - This potential site is located 24 km north of the community of Pinehouse, where the Churchill River empties into Pinehouse Lake. Head and flow data are not available for this site, however, the river at this point does pass through a narrow gorge which may indicate significant head potential. The minimum daily waterflow for this location can be expected to be at least 125 m^3/s.

2.0 WOOD RESOURCES

An estimated 1.1 million cords of standing forest exist within a 19 km radius of Pinehouse. Softwoods such as jackpine and black spruce make up 66% of the local species, with hardwoods making up the remainder.

In terms of maturity of size, the local forest is broken down as follows:

	Softwoods	Hardwoods
10 cm - 18 cm diameter class	65%	50%
20 cm - 23 cm diameter class	18%	21%
25 cm + diameter class	17%	19%

Estimated additional biomass volumes available from foliage and tops, have been estimated by Saskatchewan Power Corporation as follows:

Foliage:	85,000 - 170,000 cords
Tops:	63,611 - 138,000 cords

The majority of residents use wood as a heating and cooking fuel. Many houses are equipped with oil furnaces, oil space heaters, propane furnaces and propane water heaters, but these are not used, due to the costs associated with fuel.

Wood cut in 1.2 m lengths is available to residents at a site just outside of town. Wood is also collected on an individual basis in the bush immediately surrounding the community. Saskatchewan Power Corporation has estimated that a wood gasification/electrical generation plant for the community of Pinehouse, would require approximately 74,000 cords over a 50 year period, or approximately 1480 cords per year.

3.0 WIND RESOURCES

No data is available on the wind characteristics of this location. General observations of global wind patterns indicate that during the winter months, the westerly flow of winds shift south, subjecting the northern areas of Saskatchewan to frequent periods of calm. Further investigation of the micro-climatic factors (including significant topographical features and specific site wind characteristics), would be required to establish the potential for wind at this site. The nearest weather station that collects data on wind characteristics is at La Ronge.

4.0 PEAT RESOURCES

The Pinehouse-La Ronge area is one of two areas that have been studied in detail by Saskatchewan Energy and Mines for the presence of fuel grade peat. A number of fuel peatlands were identified - both close to the community of Pinehouse and close to the road to Pinehouse (generally within 10-15 km).

The most significant bog identified in proximity to Pinehouse is located along the shore of Pinehouse Lake, about 10 km southwest of the community. No specific testing of this bog area has occurred to date, primarily because these bog areas are heavily treed and difficult to access by helicopter. Further investigation is highly recommended.

St. George's Hill

REMOTE COMMUNITY ANALYSIS

I. COMMUNITY PROFILE

ST. GEORGE'S HILL

STATUS:

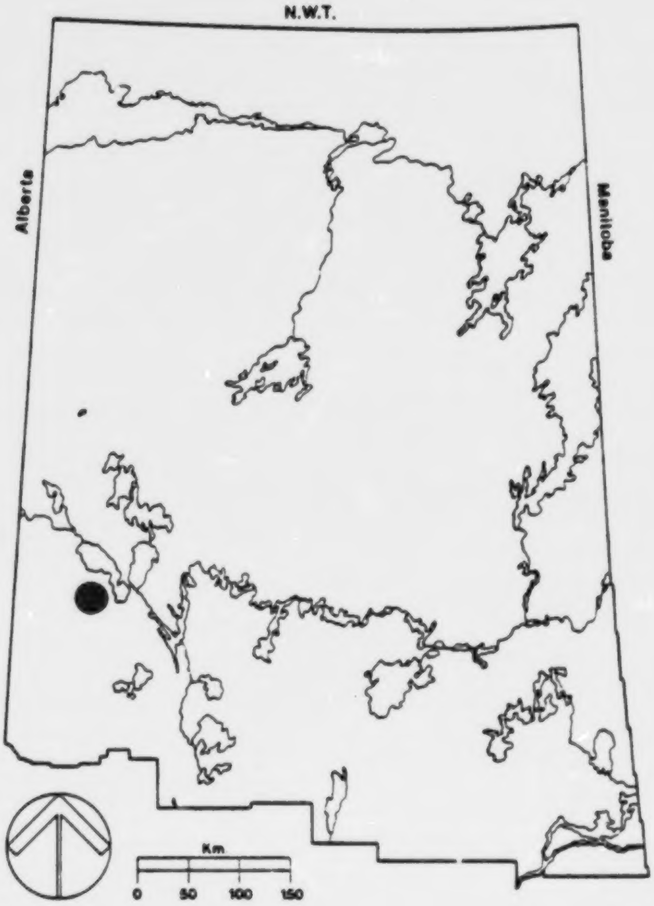
Local Advisory Council

L.A.C.

LOCATION:

Lat: 55° 52'

Long: 108° 57'

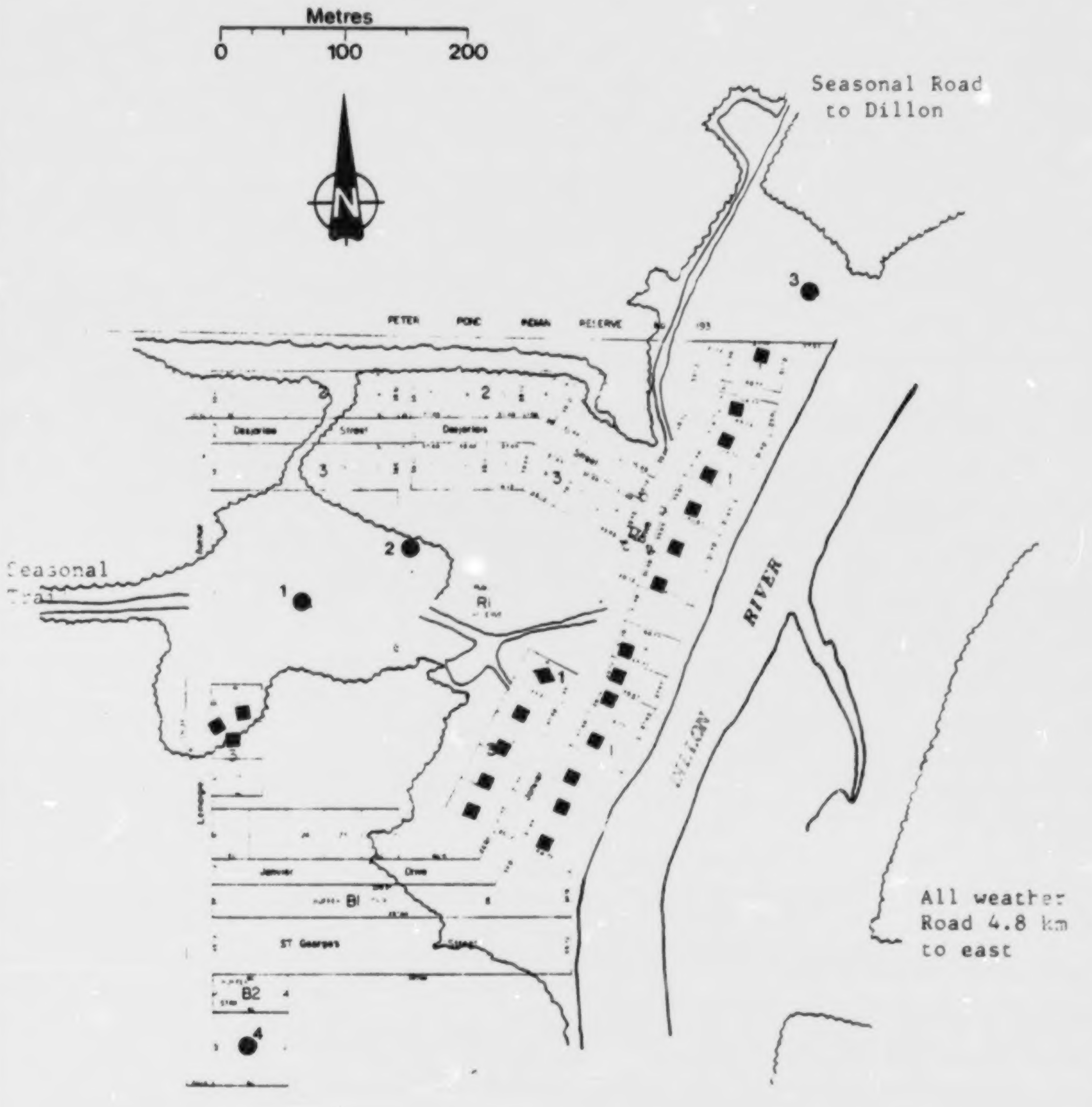


Source of Information:

Northern Saskatchewan Community Directory, August 1981.
Brian Ritchie, Capital Co-ordinator, Northern Lights School Division, January 1983.
Larry Evans, Manager, Sask Housing Corporation, Northern Branch, January 1983.

Interviews and Correspondence

Brian Finigan, Hudson's Bay Store, Dillon, February 1983.
Resource Officer, Buffalo Narrows, February 1983.
Nicki Brandon, Community Planning, D.N.S., February 1983.


Metres
0
100
200
N
Seasonal Road to Dillon
PETER POND INDIAN RESERVE 193
Desjarlais Street
3
2
1
3
2
1
Seasonal Trail
R1
RIVER
B1
Janvier Drive
St Georges Street
B2
4
All weather Road 4.8 km to east

LEGEND

- ■ Residential
- ● Institutional
- ◆ Commercial
- ▲ Industrial
- ☁ Vegetation

● 1 - SCHOOL
2 - TEACHERAGE
3 - COMMUNITY HALL
4 - DNS WAREHOUSE

◆—1 - POOL HALL

St. George's Hill

SOURCE: AIR PHOTO S 1:5000, JUNE 81 DNS COMMUNITY PLANNING FIELD NOTE 1979

A. HISTORY AND GROWTH

1. Community Established First survey plan registered 1974

2. Demographics:

Present Population 115 - 1981 Census Canada

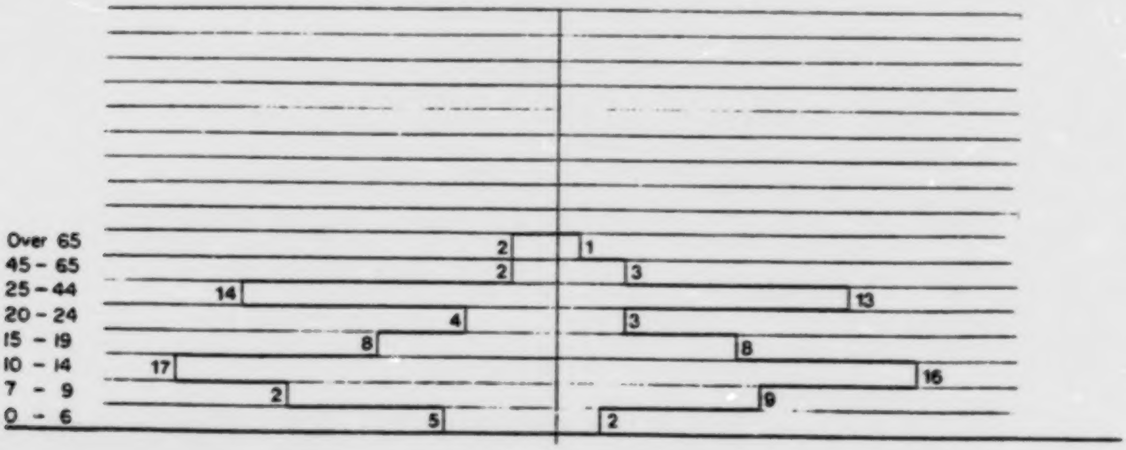
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total) (further data not available)									119	115	

Growth % Approximately 2%.

Projected Future Population Growth 1985 - 131 persons; 1990 - 145; 1995 - 160 persons.

Ethnic Mix: White ____% } majority are Metis
Metis ____% }
(Chipewyan) Indian ____%
Other ____% ________________

Age-Sex Structure - 1980 Municipal Census



No. of Males-84 No. of Females-55

C. Community Facilities

---

1. Health

Clinic in Community X yes ____ no

Size of Facility Hospital 10.3m^2

Outpost Hospital ____ yes X no

Served By ____________

Staff ____ Doctors ____ Nurse ____ Other

DNS Nurse visits once a week from Buffalo Narrows.

---

2. Education

School located in community X yes ____ no constructed 1978

Kindergarten - Grade 9 Size 706 sq. m. Classrooms 3 plus activity room, Home Economics and Shop.

Teacherages: Size ____ sq. m. 3 teachers, 57 students.

3. Residential

(1) Number of houses in community 22 ±

(2) Number of houses with sewer and water 0%

(3) Number of houses with power hook-up 100%

(4) Housing condition: Good 9/20 less than 5 years old - 45%

Fair 11/20, 5-10 yrs. old - 55% Poor ____

(5) Number of houses constructed annually approximately 3 Size 90-100m^2

(6) Heat Source Wood/oil furnaces, wood space heaters.

(7) Cooking Wood

(8) Housing construction notes: Since 1973 houses built with basement to CMHC standards. R24 walls, R40 ceilings, prior to 1973 houses were 2, 3, 4 bedroom 800-900 sq. ft. Now to standard plans 1000-1100 sq. ft. Cost $60,000.

Source: Larry Evans, Sask Housing Northern Division.

4. Community Buildings

	Type/Use	Size		Type/Use	Size
1.	Community Hall	71m^2	4.		
2.			5.		
3.			6.		

5. Other Institutional/Commercial/Industrial Facilities (private, etc.)

	Type/Use	Size		Type/Use	Size
1.	DNS Warehouse	N/A	4.		
2.			5.		
3.			6.		

D. Economic Activities

Agriculture		Hunting	X	Trapping	X
Fishing	X	Mining		Transportation	
Forestry		Tourism		Service Centre	

Other ______

E. Communications and Transportation Links

(1) Post Office ____ yes X no Serviced from Buffalo Narrows.

Television ____ yes ____ no source & no. of stations

Radio ____ yes ____ no source & no. of stations

Telephone X yes ____ no Listed under Dillon.

____ individual ____ community

____ local ____ long distance (information not available)

High Frequency Radio ____ yes ____ no

operated by ______

F. Transportation Links

1. Access to Community by Scheduled Services

	Carrier	Frequency	Origin
Air			
Truck	Seasonal road access from Dillon and Buffalo Narrows		
Bus			
Other			

2. Local Transportation for Visitors

Taxi ____ yes _X_ no

Rental Vehicles ____ yes _X_ no

Charter Aircraft ____ yes _X_ no ____ where/whom

3. Local Transportation - by Community

	Yes	No	Type
Boats	X		
Snowmobiles	X		
Cars	X		
Heavy Vehicles			information unavailable
Other			

G. Notes: Regarding historical growth of community.
Social composition and decision-making.
Past and future socio-economic trends.

At present, St. George's Hill is serviced by diesel generator supplied by North-Sask Electric Ltd. and located at Dillon. With the future possibility of tying into the all-weather road which connects Dillon and Buffalo Narrows, would greatly increase opportunities for growth and expansion.

St. George's Hill will become incorporated as a northern hamlet under the proposed Act.

Scheduled for hook-up to the Saskatchewan Power grid in 1983.

H.1

Diesel Electric Generation

1. Location: ST. GEORGES HILL (SEE DILLON)
2. Owner: ______
3. Diesel Type: ______

4.

Customers 1981	Number	1981 Consumption (KWH)
Residential Commercial Government Street Lights		
Total		

Average Residential Consumption ______ kWh/Mo (1981)

Diesel Fuel:

	1981	1982	1983
Cost $			
Annual Fuel Use Litres			
KWh/litre fuel			
Fuel cost increases over previous year (%)			

Fuel Storage Capacity

Peak Load

Forecast Peak Loads:

1981 ______ kW; 1982 ______ kW; 1983 ______ kW;

1984 ______ kW; 1985 ______ kW

Notes:

H.2 ENERGY PROFILE - ANNUAL CONSUMPTION - ST. GEORGE'S HILL

Classification	Annual Energy Consumption Electricity (MWH)	Fuel Oil $(\times 10^3)^L$	Propane $(\times 10^2)^L$	Wood (Cords)
Education	55	63	73	20
Health	3	1	--	--
Protection	--	--	--	--
Communications	26	--	--	--
Transport Services	--	--	--	--
Government	15	3	--	--
Community Services	7	--	--	5
Commercial	8	--	--	10
Residential	110	5	33	130
Total	224	72	106	165

H.3 ENERGY PROFILE - SOURCE FUEL CONSUMPTION

Classification	Annual Source Fuel Consumption - Basis 1982 Facilities				
	Electricity[1] (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	925	2,438	199	328	3,890
Health	50	39	--	--	89
Protection	--	--	--	--	--
Communications	437	--	--	--	437
Transport Services	--	--	--	--	--
Other Government	252	116	--	--	368
Community Services	118	--	--	82	200
Commercial	135	--	--	164	299
Residential	1,851	194	90	2,132	4,267
Total	3,768	2,787	289	2,706	9,550

1. Lists the consumption of source fuel (usually fuel oil) required to generate electrical energy, and uses an average performance index of 2.3 kwh/litre of fuel.

I. RESOURCE ASSESSMENTS

1.0 POTENTIAL SMALL SCALE HYDRO ELECTRIC SITES

1.1 Background

St. George's Hill, Dillon and Michel Village are all located within relatively close proximity to each other. Presently, St. George's Hill utilizes electrical power generated in Dillon.

1.2 Sites Within a 16 km Radius

Dillon River: This area of marginal small hydro potential is located about 16 km southwest of the settlement of St. George's Hill. At this point, a number of rapids occur where the river travels through a narrow valley. No accurate measurements of head potential are available. River flow gauging measurements taken approximately 20 km upstream indicate an average annual minimum daily discharge of .707 m^3/s. On initial assessment, river flow would appear to be too small to support even a very small hydro-electric station on a continuous basis. Similar conclusions were made in a general overview of small hydro in the north in a 1973 report.*

---

* S.P.C. Feasibility of Small Hydro Electric Plants for Remote Communities in Northern Saskatchewan, S.P.C., R and D Centre, Report PE 01-5335 July 1973.

2.0 WOOD RESOURCES

Research undertaken by S.P.C. indicates that standing wood reserves within a 19 km radius of the Dillon/St. George's Hill area total 1.2 millon cords. About 52% of this reserve are hardwoods (aspen and birch) and 48% are softwoods, (jackpine, black spurce and white spruce).

In terms of foresty maturity, the reserve is broken down as follows:

	Softwoods	Hardwoods
10 - 18 cm diameter class	55%	42%
20 - 23 cm diameter class	17%	20%
25 + diameter class	28%	38%

Estimated additional biomass volume available from foliage and tops has been estimated by S.P.C., and is illustrated below:

Foliage - 94,000 - 187,000 cords
Tops - 70,000 - 152,000 cords

The only forest related industry in the area is a small sawmill located in Dillon and operated by the Department of Indian and Northern Affairs to supply local building materials.

S.P.C. has concluded that a more than sufficient supply of wood exists to supply feedstock for a local power/gasification plant, in addition to the demand for wood that currently exists in the community.

3.0 WIND RESOURCES

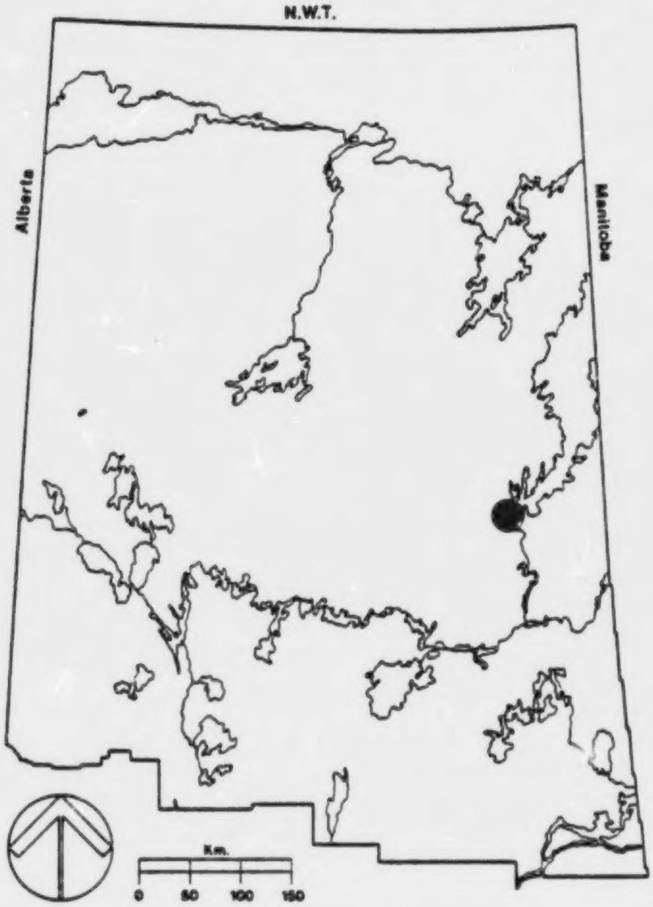
Very little data is available on wind for St. George's Hill. The federal Department of the Environment has, however, recently set up a monitoring station in Buffalo Narrows. Unfortunately, a solid base of historical data does not yet exist, and therefore conclusions with regard to wind potential are premature at that time. Northern areas of Saskatchewan are generally subject to frequent periods of calm during the winter months, which could prove to be a disadvantage in operating a wind powered plant.

Southend

REMOTE COMMUNITY ANALYSIS

I. COMMUNITY PROFILE

SOUTHEND



STATUS:

Joint L.A.C. and Indian
Reserve - Peter Ballantyne
Band I.R. #192 D.

LOCATION:

Lat: 56°19'

Long: 103°14'

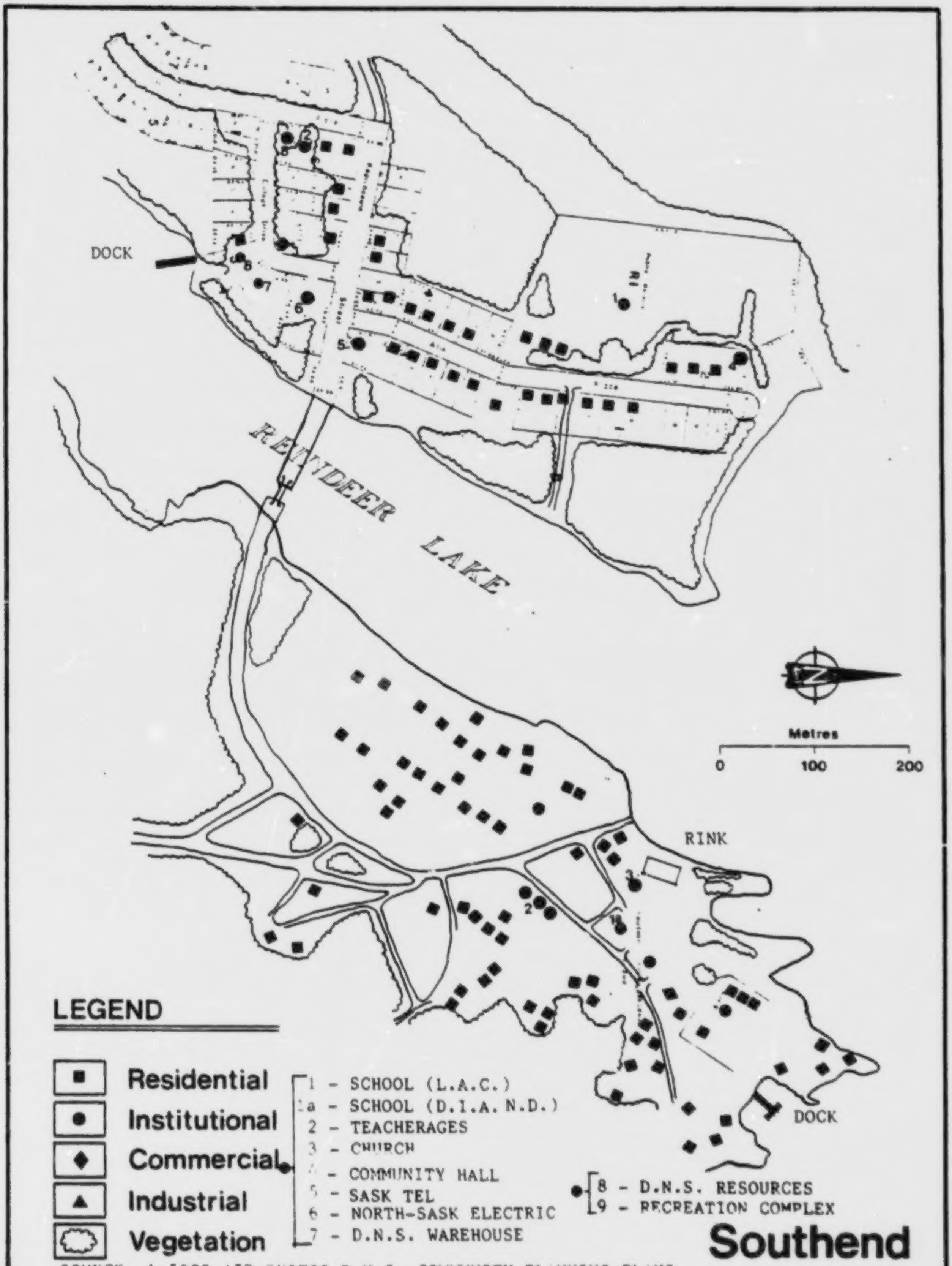
Source of Information:

Publications and Articles

Northern Saskatchewan Community Directory, August 1981.
Institute of Northern Studies, Settlements of Northern Sask., 1973.
Denosa, "Southend Bridging the Gap" Summer/Fall 1979, pp. 18-19.
Denosa, "Graphite Mine Proposed for Southend", December 1980, p. 27.
Denosa, "New Arena Start for Southend", August 1982, p. 12.
Prince Albert Daily Herald, "Southend Turning to Alternative Energy Sources", March 19, 1982.

Interviews and Correspondence

Richard Hankinson/Helmuth Knaus - D.I.A.N.D., Prince Albert District Office, January 1983.
Cal McLachlan, Manager, North-Sask Electric Ltd., La Ronge, January 1983.
Brian Ritchie, Capital Co-ordinator, Northern Lights School Division, Prince Albert, January 1983.
Larry Evans, Manager, Sask Housing Corp., Northern Department, January 1983.
Tom Fraser, Community Planning Branch, D.N.S., January 1983.
M. Rittinger, Health and Welfare Canada, Medical Services, January 1983.
Manager, Hudson's Bay Store, Southend, February 1983.
Hans Ulrickson, Manager Gulf Service Station, Southend, February 1983.
Resource Officer, Southend Reindeer, February 1983.
Harold Bruning, La Ronge Propane, La Ronge, February 1983.


DOCK
REINDEER LAKE
RINK
DOCK
N
Metres
0
100
200
LEGEND
■ Residential
● Institutional
◆ Commercial
▲ Industrial
Vegetation
1 - SCHOOL (L.A.C.)
1a - SCHOOL (D.I.A.N.D.)
2 - TEACHERAGES
3 - CHURCH
4 - COMMUNITY HALL
5 - SASK TEL
6 - NORTH-SASK ELECTRIC
7 - D.N.S. WAREHOUSE
8 - D.N.S. RESOURCES
9 - RECREATION COMPLEX
Southend

SOURCE: 1:5000 AIR PHOTOS D.N.S. COMMUNITY PLANNING PLANS

A. HISTORY AND GROWTH (Indian Reserve)

1. Community Established ______________________

2. Demographics:

Present Population 350

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total)						325					350

Growth % ______________________

Projected Future Population Growth ______________________

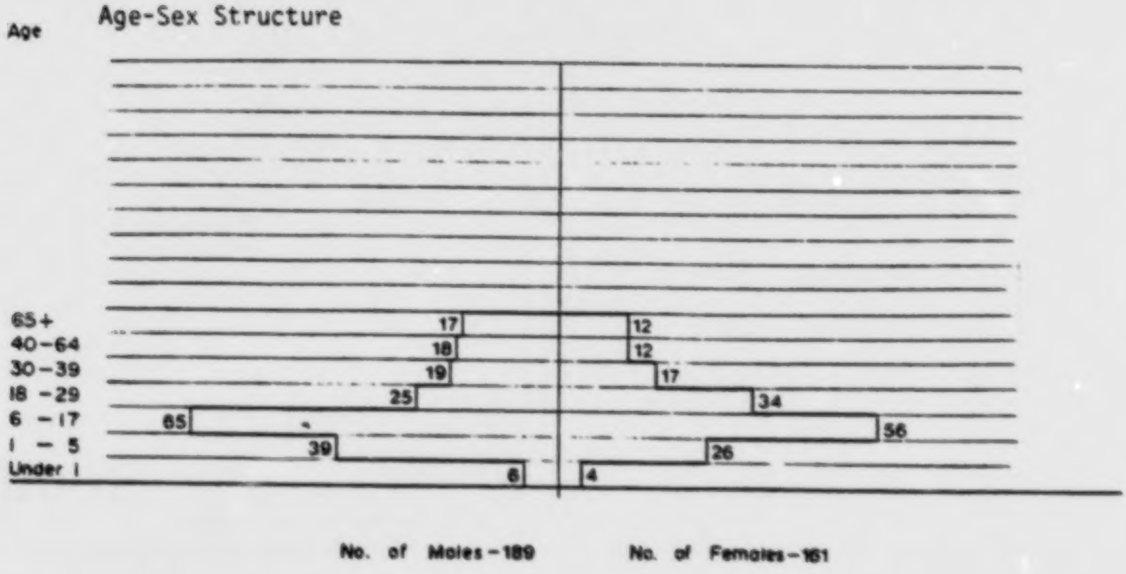
Ethnic Mix: White ____ %

Metis ____ %

(Cree) Indian 100 %

Other ____ % ______________________

Age-Sex Structure



A. HISTORY AND GROWTH (L.A.C.)

1. Community Established first survey plan registered in 1975

2. Demography:

Present Population 178

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total) (additional data not available)						198			176		178

Growth % 4% estimated as medium growth by D.N.S. Community Planning.

Projected Future Population Growth @ 4.0%

1985 - 214 persons; 1990 - 260; 1995 - 316.

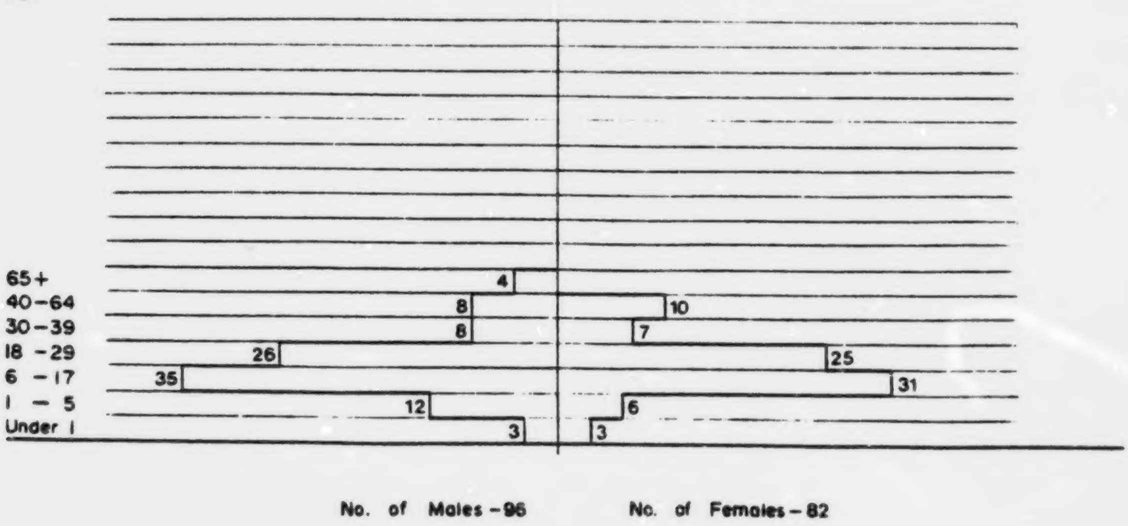
Ethnic Mix: White ____ %

Metis 95 %

Indian ____ %

Other ____ % ________

Age-Sex Structure - Based on 1980 Municipal Census.



B. Community Services

1. Water

Source		Distribution		Serving		Treatment	
Lake	X	Pipe		Government Buildings	X	Sedimentation	
Stream		Truck		Commercial Buildings		Filtration	
Wells	X	Individual Systems	X	Residences		Chlorination	
Other		None		Standpipes		Flouridation	
						None	X

2. Sewage

Collection System		Serving		Disposal	
Pipe		Government Buildings	X	Lagoon (school to be hooked up to sewage disposal pit)	
Truck		Commercial Buildings		Septic Tanks	X
Individual Systems	X	Residences		Treatment Plant	
None				None	

3. Solid Waste Disposal

Garbage Collection Organized		Yes	X	No	
Landfill Site Utilized	X	Yes		No	sometimes
Other Methods of Disposal	X	Yes		No	(wherever)

4. Fire Protection Organized ____ Yes _X_ No

Equipment ____________________

5. Police Protection - R.C.M.P. _X_ Yes ____ No

Patrolled from La Ronge

C. Community Facilities (Indian Reserve)

1. Health

Clinic in Community X yes ____ no

Size of Facility Hospital $241m^2$ (Atco Trailer)

Outpost Hospital X yes ____ no

Served By La Ronge

Staff ____ Doctors ____ Nurse ________ Other

2 nurses - doctor visits every second week.

2. Education

School located in community X yes ____ no

Kindergarten - Grade 9 Size 8653 sq. m. Classrooms 7

Teacherages: Size 4544 sq. m. 80 students.

3. Residential

(1) Number of houses in community 50

(2) Number of houses with sewer and water 0%

(3) Number of houses with power hook-up 100%

(4) Housing condition: Good (information not available)

Fair ________ Poor ________

(5) Number of houses constructed annually ____ size ____

(6) Heat Source All wood - no oil heat

(7) Cooking wood - some propane

(8) Housing construction notes: Standard D.I.A.N.D. construction specs. Sr. citizens 5 unit complex being built.

C. Community Facilities (L.A.C.)

1. Health (on previous page)

Clinic in Community X yes ____ no

Size of Facility Hospital ____

Outpost Hospital X yes ____ no

Served By ____

Staff ____ Doctors ____ Nurse ____ Other

2. Education (L.A.C.)

School located in community X yes ____ no - built 1982

Kindergarten - Grade 9 Size 975 sq. m. Classrooms ____

Teacherages: Size ____ sq. m. 124 students

3. Residential (L.A.C.)

(1) Number of houses in community 23

(2) Number of houses with sewer and water 0%

(3) Number of houses with power hook-up 100%

(4) Housing condition: Good 7/25 - 28% less than 5 years old

Fair 18/25 - 72% - 8-10 years old Poor ____

(5) Number of houses constructed annually 2-3 units Size $92.9m^2$-$102m^2$

(6) Heat Source Wood/oil furnaces or oil furnaces, also space heaters

(7) Cooking ____

(8) Housing construction notes: Since 1973 houses built with basement to CMHC standards. R24 walls, R40 ceilings, prior to 1973 houses were 2, 3, 4 bedroom 800-900 sq. ft. Now to standard plans 1000-1100 sq. ft. Cost $60,000.

Source: Larry Evans, Sask Housing Northern Division.

4. Community Buildings

Type/Use	Size	Type/Use	Size
1. Pumphouse	445 m^2	4. Skating Rink	800.1 m^2
2. Storage	37.1 m^2	5. R.C. Church	N/A
3. Band Office	98.2 m^2	6. Band Hall	N/A

5. Other Institutional/Commercial/Industrial Facilities (private, etc.)

Type/Use	Size	Type/Use	Size
1. Hudson Bay Store and buildings	650m^2	4. DNS Staff Building	74.3m^2
2. Reindeer Lake Gulf Service	N/A	5. DNS Warehouse/Office	178m^2
3. Nordic Lodge	Outfitters	6. Sask Tel	33m^2
		7. Se Seep Air Service	75m^2

D. Economic Activities

Agriculture		Hunting	X	Trapping	X
Fishing	X	Mining		Transportation	
Forestry		Tourism (guiding)	X	Service Centre	

Other Mining possible

E. Communications and Transportation Links

(1) Post Office X yes ____ no - serviced from La Ronge

Television X yes ____ no - source & no. of stations - CBC Saskatoon

Radio ____ yes X no - source & no. of stations

Telephone X yes ____ no

X individual ____ community

X local X long distance

High Frequency Radio X yes ____ no

operated by information not available

F. Transportation Links

1. Access to Community by Scheduled Services

	Carrier	Frequency	Origin
Air	Charter SeSeep Air Services Southend or Charter from La Ronge		
Truck	All-weather road	as required	
Bus	No regular service		
Other			

2. Local Transportation for Visitors

Taxi _____ yes _____ no __X__

Rental Vehicles _____ yes __X__ no

Charter Aircraft __X__ yes _____ no _____ where/whom

3. Local Transportation - by Community

	Yes	No	Type
Boats	X		
Snowmobiles	X		
Cars	X		
Heavy Vehicles			information not available
Other			

G. Notes: Regarding historical growth of community.
Social composition and decision-making.
Past and future socio-economic trends.

The largest graphite deposit in North America may someday be developed near Southend by SMDC and Superior Graphite Company of Chicago. Mine site is at Deep Bay, located at the north end of Pollon Lake, seven miles northeast of Southend. The Peter Ballantyne Band stands to receive royalty payments of $70,000 per year, and $300,000 per year if land is later confirmed as a reserve. Serious drainage problem on Reserve; water seepage and contamination of lake a problem. Interested in using solar for water heating in recreation area and greenhouse. Not until the fall of 1979 was a causeway built across the 500 foot wide 20 foot channel of Reindeer Lake, to connect the mainland L.A.C. community to the Island Reserve Community. Under proposed Act, Southend will be incorporated as a northern hamlet.

H.1

Diesel Electric Generation

1. Location: SOUTH END [1]
2. Owner: North Sask Electric
3. Diesel Type: 2-250 KW

4.

Customers 1981	Number	1981 Consumption (KWH)
Residential	72	332,276
Commercial	5	133,794
Government	20	282,004
Street Lights	3	8,590
Total	100	756,665

Average Residential Consumption 384.5 kWh/Mo (1981)

Diesel Fuel:

	1981	1982	1983
Cost $	0.279	0.2956	0.2522
Annual Fuel Use Litres	276,055	303,660[2]	334,030[2]
KWh/litre fuel	2.74		
Fuel cost increases over previous year (%)	+6.28	+5.9	-14.7

Fuel Storage Capacity 2 x 22,730 = 45460 litres

Peak Load 180 KW

Forecast Peak Loads:

1981 200 kW; 1982 230 kW; 1983 280 kW;

1984 330 kW; 1985 390 kW

Notes:

[1] Source: North Sask Electric

[2] Estimate based on 10% fuel usage increase p.a.

H.2 ENERGY PROFILE - ANNUAL CONSUMPTION - SOUTHEND

	Annual Energy Consumption			
Classification	Electricity (MWH)	Fuel Oil (x 10^3)L	Propane (x 10^2)L	Wood (Cords)
Education	288	95	110	--
Health	25	5	220	--
Protection	--	--	--	--
Communications	166	--	--	--
Transport Services	--	--	--	--
Government	11	7	22	--
Community Services	69	22	10	5
Commercial	134	12	32	--
Residential	332	48	273	360
Total	1,025	189	667	365

H.3 ENERGY PROFILE - SOURCE FUEL CONSUMPTION

Classification	Electricity[1] (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
	Annual Source Fuel Consumption - Basis 1982 Facilities				
Education	4,068	3,677	299	--	8,044
Health	353	194	598	--	1,145
Protection	--	--	--	--	--
Communications	2,345	--	--	--	2,345
Transport Services	--	--	--	--	--
Other Government	155	271	60	--	486
Community Services	975	851	27	82	1,935
Commercial	1,893	464	87	--	2,444
Residential	4,689	1,858	743	5,904	13,194
Total	14,478	7,315	1,814	5,986	29,593

1. Lists the consumption of source fuel (usually fuel oil) required to generate electrical energy, and uses an average performance index of 2.74 kwh/litre of fuel.

I. RESOURCE ASSESSMENTS

1.0 POTENTIAL SMALL SCALE HYDRO ELECTRIC SITES

1.1 Background

There are two potential sites located within 16 km of the community of Southend, on the Reindeer River. as it flows south from Reindeer Lake.

1.2 Sites Within a 16 km Radius

Whitesand Dam - Located approximately 13 km southwest of the community, this existing dam offers good potential for utilization of small hydro technolgy. The dam is used to regulate water entering the Churchill River and Power Generation system. The average minimum daily discharge measured at this site and averaged over 41 years is 192 m^3/s. Head currently available is 6 m. Assuming a generating efficiency of 50%, a firm generating capacity of 5.6 MW exists at this site.

Devil Rapids - This potential site is located downstream from the Whitesand dam, approximately 16 km from the Community of Southend. The minimum daily discharge can be expected to be similar to that measured at the Whitesand Dam (192 m^3/s). Accurate information on available head is not currently available. Topographical interpretation indicates that the river passes through a narrow gorge at this point.

2.0 WOOD RESOURCES

Research undertaken by S.P.C. indicates that the standing wood reserves within a 19 km radius of the community of Southend amounts to about 403,000 cords. Hardwoods make up about 19% of this reserve with the remaining being softwoods.

The major hardwood species found in this area are white birch and aspen. Jackpine, black spruce and white spruce are the major softwood species.

In terms of forest maturity, the forest is broken down as follows:

	Softwoods	Hardwoods
10 - 18 cm diameter class	70%	54%
20 - 23 cm diameter class	25%	38%
25 + diameter class	5%	8%

Estimated additional biomass volumes available from foliage and tops has been estimated by S.P.C. as follows:

Foliage - 33,000 - 66,000 cords
Tops - 25,000 - 53,000 cords

Fuel wood collection is unorganized. During the winter season, residents usually travel into the bush once every two weeks or so to gather fuelwood. Snowmobiles with sleighs are most often used to collect the wood.

No wood is seasoned; all fuelwood used in the community is green and freshly cut.

While some residents do have relatively modern wood burning equipment, the majority of residents in the community utilize very cheap woodstoves, usally made of tin.

S.P.C. has estimated that if a gasification plant were designed to generate electricity for the entire community for fifty years, this would consume about 19% of the standing reserves within a 19 km radius.

3.0 WIND RESOURCES

No data is available on wind characteristics at this site, however, in a report prepared by S.P.C., a site, 11 km south of the community, on Big Island, was identified as location where topographical features would be conducive to wind power utilization.* Data may be collected for this site in the future. No determination of the actual wind power potential of this site can be made at present.

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* Bergsteinsson J.L. Initial Screening of Wind Power Sites Prepared by Saskatchewan Research Council for SRC, February 1979.

Stony Rapids

REMOTE COMMUNITY ANALYSIS

I. COMMUNITY PROFILE

STONY RAPIDS

STATUS:

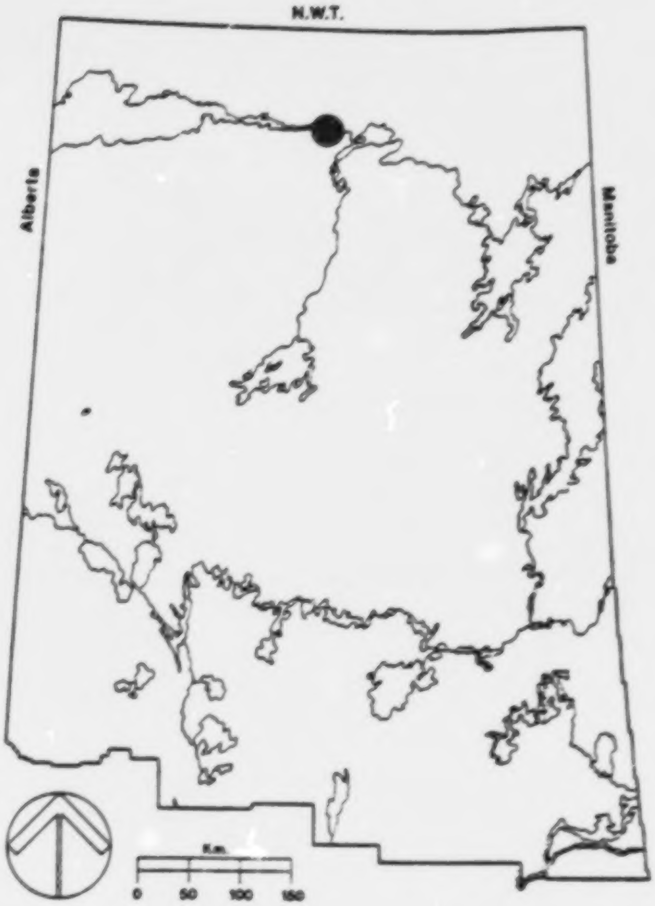
Local Advisory Council

L.A.C.

LOCATION:

Lat: 59° 16' N

Long: 105° 50' W



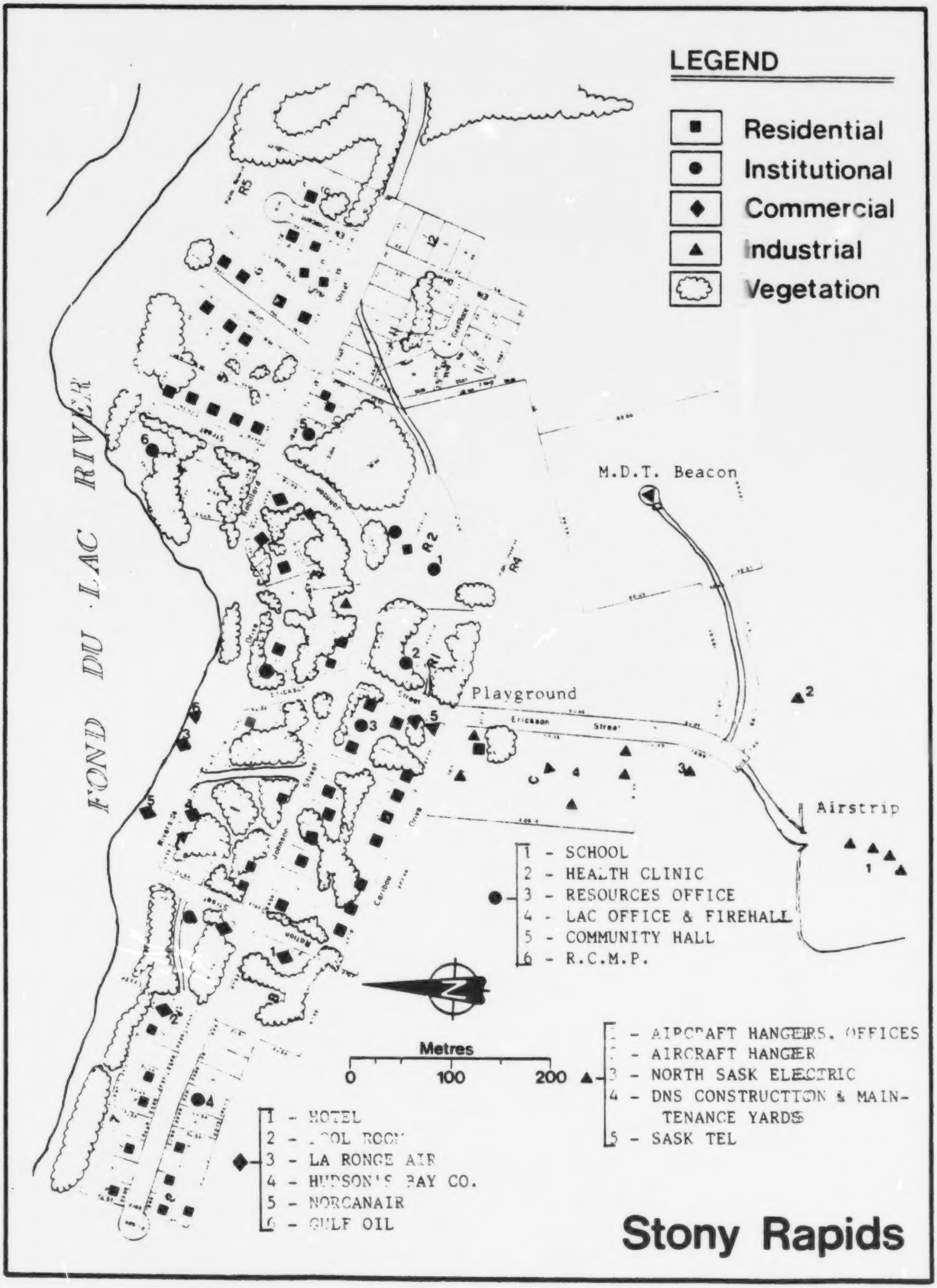
Source of Information:

Publications and Articles

Northern Saskatchewan Community Director, August 1981.
Institute of Northern Studies, Settlements of Northern Sask.
Black Lake Community Planning Study, HFW, 1978-80.
Sask Power Corporation, "Energy Audit of School @ Stony Rapids, October 1982

Interviews and Correspondence

Richard Hankinson/Helmuth Knaus - D.I.A.N.D., Prince Albert District Office, January 1983.
Cal McLachlan, Manager, North-Sask Electric Ltd., La Ronge, January 1983.
Brian Ritchie, Capital Co-ordinator, Northern Lights School Division, Prince Albert, January 1983.
Larry Evans, Manager, Sask Housing Corp., Northern Department, January 1983.
Tom Fraser, Community Planning, D.N.S. - Prince Albert, January 1983.
David Klippenstein, Underwood McLellan, Athabasca Regional Service Study, January 1983.
Peter Ashcroft, Resource Officer, Stony Rapids, February 1983.
John Campbell, Gulf Oil Bulk Sales, Stony Rapids, February 1983.
Elizabeth Segretts, L.A.C., Stony Rapids, February 1983.
Manager, Hudson Bay Store, Stony Rapids, February 1983.
Nipawin Air, February 1983.
Athabasca Air, February 1983.

LEGEND
■ Residential
● Institutional
◆ Commercial
▲ Industrial
Vegetation
FOND DU LAC RIVER
M.D.T. Beacon
Playground
Erickson Street
Airstrip
Street
R1
R2
R4
R5
1 - SCHOOL
2 - HEALTH CLINIC
3 - RESOURCES OFFICE
4 - LAC OFFICE & FIREHALL
5 - COMMUNITY HALL
6 - R.C.M.P.
1 - AIRCRAFT HANGERS, OFFICES
2 - AIRCRAFT HANGER
3 - NORTH SASK ELECTRIC
4 - DNS CONSTRUCTION & MAINTENANCE YARDS
5 - SASK TEL
1 - HOTEL
2 - POOL ROOM
3 - LA RONGE AIR
4 - HUDSON'S BAY CO.
5 - NORCANAIR
6 - GULF OIL
Metres
0
100
200
N
Stony Rapids

A. HISTORY AND GROWTH

1. Community Established 1920's trappers begin to settle in Stony Rapids area - 1921 Hudson's Bay Co. estab.
2. Demographics: Became Northern Administrative Centre - North Sask - 1946.

Present Population 249 - S.H.S.P. stats.

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total)	164	175	191	178	195	203	242	225	223	240	249

Growth % 2.5%

Projected Future Population Growth 2.5%

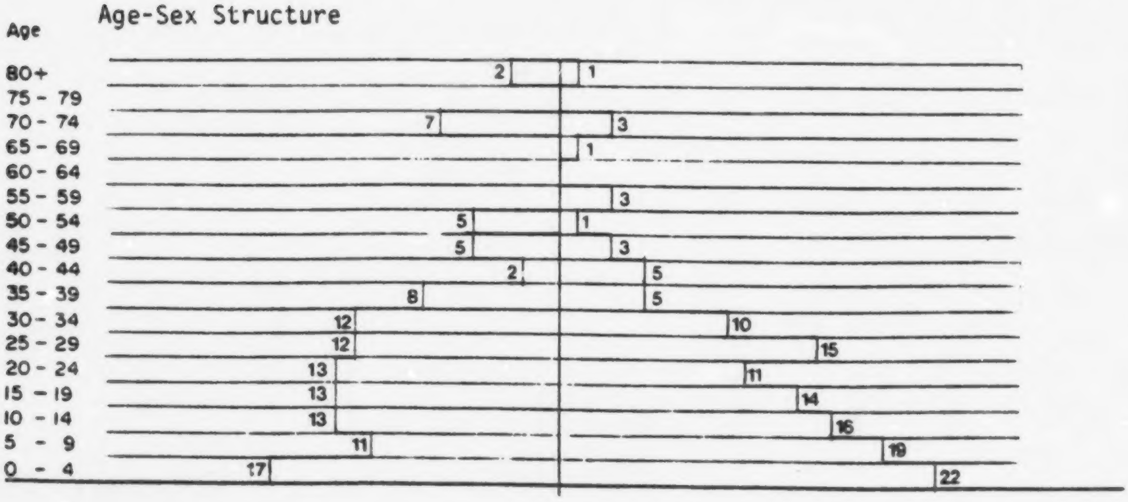
Ethnic Mix: White 10 %

Metis 80 %

Indian 10 %

Other %

Age-Sex Structure



No. of Males-120 No. of Females-129

B. Community Services

1. Water

Source		Distribution		Serving		Treatment	
Lake		Pipe	X	Government Buildings	X	Sedimentation	
Stream	X	Truck	X	Commercial Buildings	X	Filtration	
Wells		Individual Systems	X	Residences		Chlorination	X
Other		None		Standpipes		Flouridation	
						None	

2. Sewage

Collection System		Serving		Disposal	
Pipe	X	Government Buildings	X	Lagoon	
Truck	X	Commercial Buildings	X	Septic Tanks	X
Individual Systems	X	Residences		Treatment Plant	
None				None	

3. Solid Waste Disposal

Garbage Collection Organized X Yes ____ No

Landfill Site Utilized X Yes ____ No

Other Methods of Disposal ____ Yes X No

---

4. Fire Protection Organized X Yes ____ No

Equipment Fire Hall & Truck

---

5. Police Protection - R.C.M.P. X Yes ____ No

Patrolled from Stony Rapids

C. Community Facilities

1. Health

Clinic in Community X yes ____ no

Size of Facility Hospital 235.9m^2

Outpost Hospital ____ yes ____ no

Served By Uranium City

Staff ____ Doctors 1 Nurse ____ Other

Doctors visit and have weekly clinics

2. Education

School located in community X yes ____ no 1976 & 1979

Kindergarten - Grade 10 Size 2091 sq. m. Classrooms 3 + Science Room, Commercial Room, Home Economics, Library, gym.

Teacherages: Size ____ sq. m.

67 students - 4 teachers

3. Residential

(1) Number of houses in community 60

(2) Number of houses with sewer and water 40%

(3) Number of houses with power hook-up 100%

(4) Housing condition: Good 11/32 (34%) less than 5 yrs. old.

Fair 16/32 (50%) 5-10 yrs. old, 5/32 (16%) more than 10 yrs. old.

(5) Number of houses constructed annually 2-3 units size 92.9m^2-102m^2

(6) Heat Source wood/oil furnaces or oil furnaces, also space heaters

(7) Cooking propane/electric/wood.

(8) Housing construction notes: Since 1973 houses built with basement to CMHC standards. R24 walls, R40 ceiling, prior to 1973 houses were 2, 3, 4 bedroom 800-900 sq. ft. Now to standard plans 1000-1100 sq. ft. Cost $60,000 -85,000

Source: Larry Evans, Sask Housing Northern Division.

4. Community Buildings

	Type/Use	Size		Type/Use	Size
1.	Stony Rapids Hotel	350m^2	4.	R.C.M.P. Building and Residence	240m^2
2.	L.A.C. Office and Fire Hall	465m^2	5.	Hudson Bay	325m^2
3.	Gas Station	N/A	6.	DNS Resource Building	111.8m^2
			7.	Dept. of Highways Garage	81.9m^2

5. Other Institutional/Commercial/Industrial Facilities (private, etc.)

	Type/Use	Size		Type/Use	Size
1.	Gulf Oil	55m^2	4.	MOT Building	30m^2
2.	Pool Hall	93m^2	5.	D.N.S.	115m^2
3.	Sask Tel	33m^2	6.	Community Hall	595m^2
			7.	Freezer	30m^2

D. Economic Activities

Agriculture		Hunting	X	Trapping	X
Fishing	X	Mining	X	Transportation	X
Forestry		Tourism	X	Service Centre	X

Other ____________________

E. Communications and Transportation Links

(1) Post Office X yes ____ no

Television X yes ____ no

Radio X yes ____ no

Telephone X yes ____ no

X individual ____ community

X local X long distance

High Frequency Radio X yes ____ no

operated by ____________

F. Transportation Links

1. Access to Community by Scheduled Services

	Carrier	Frequency	Origin
Air	Norcanair Scheduled	2 times per week	
Truck	Local only		
Bus	No		
Other	Barge	3-4 times year	Ft. McMurray

2. Local Transportation for Visitors

Taxi X yes ____ no

Rental Vehicles ____ yes X no sometimes DNS staff

Charter Aircraft X yes ____ no

3. Local Transportation - by Community

	Yes	No	Type
Boats	X		
Snowmobiles	X		
Cars	X		
Heavy Vehicles	DNS		
Other	Airplanes		

G. Notes: Regarding historical growth of community.
Social composition and decision-making.
Past and future socio-economic trends.

June, 1981 Environmental Study, indicated that Radon gas build up was a concern in the Stony Rapids area. Future growth of Stony Rapids very dependent upon failure of Uranium City and barge delivery of goods and services.

Under the proposed Act, Stony Rapids will be incorporated as a northern hamlet.

H.1

Diesel Electric Generation

1. Location: STONY RAPIDS [1, 3]
2. Owner: North Sask Electric
3. Diesel Type: 1981 - 2-250 Kw; 1-150 KW
   1982 - 2-600 KW; 2-250 KW (To Serve Black Lake & Stony Rapids)
4.

Customers 1981	Number	1981 Consumption (KWH)
Residential	59	405,308
Commercial	18	151,455
Government	17	417,955
Street Lights	2	19,588
Total	96	994,646

Average Residential Consumption 572.5 kWh/Mo (1981)

Diesel Fuel:

	1981	1982	1983
Cost $	0.31	0.3601	0.3722
Annual Fuel Use Litres	336,332	684,117[2]	752,529[2]
KWh/litre fuel	2.96		
Fuel cost increases over previous year (%)	+40.4	+16.2	+2.8

Fuel Storage Capacity 936,460 litres

Peak Load 450 KW (Stony Rapids & Black Lake)

Forecast Peak Loads:
(Stony Rapids Only)
1981 245 kW; 1982 275 kW; 1983 315 kW;
1984 355 kW; 1985 380 kW

Notes:

[1] Source: North Sask Electric

[2] Estimate based on consumption for Stony Rapids and Black Lake with fuel usage increasing at 10% p.a.

[3] Power for Black Lake generator at Stony Rapids as of summer 1982.

H.2 ENERGY PROFILE - ANNUAL CONSUMPTION - STONY RAPIDS

Classification	Annual Energy Consumption Electricity (MWH)	Fuel Oil $(x\ 10^3)^L$	Propane $(x\ 10^2)^L$	Wood (Cords)
Education	142	124	44	--
Health	19	30	11	--
Protection	83	77	22	--
Communications	202	--	--	--
Transport Services	62	78	--	--
Government	40	126	--	--
Community Services	20	--	--	--
Commercial	104	56	--	10
Residential	405	113	--	600
Total	1,059	604	77	610

H.3 ENERGY PROFILE - SOURCE FUEL CONSUMPTION

Classification	Electricity[1] (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
	Annual Source Fuel Consumption - Basis 1982 Facilities				
Education	1,857	4,799	120	--	6,776
Health	248	1,161	30	--	1,439
Protection	1,085	2,980	60	--	4,125
Communications	2,641	--	--	--	2,641
Transport Services	811	3,019	--	--	3,830
Other Government	523	4,876	--	--	5,399
Community Services	261	--	--	--	261
Commercial	1,360	2,167	--	164	3,691
Residential	5,295	4,373	--	9,840	19,508
Total	14,081	23,375	210	10,004	47,670

1. Lists the consumption of source fuel (usually fuel oil) required to generate electrical energy, and uses an average performance index of 2.96 kwh/litre of fuel.

I. RESOURCE ASSESSMENTS

1.0 POTENTIAL SMALL SCALE HYDRO ELECTRIC SITES

1.1 Background

There is one potential hydro-electric site within 16 km of Stony Rapids. Another site, Elizabeth Falls, is within close proximity.

At present electricity for Black Lake is generated in Stony Rapids. Both sites examined in this assessment have more than enough potential power to service both communities.

In reference to Black Lake, two additional sites were identified as having hydro-electric potential: the Chipman River (30 km east) and Burr Falls on the Fond du Lac River (55 km southeast). Further details on these sites can be found in the Black Lake profile.

1.2 Sites Within 16 km Radius

Woodcock Rapids: This is a set of rapids located on the 4 km mark of the Fond du Lac River, between Middle Lake and Fond du Lac (the lake). The river level drops approximately 27 m over this 6.4 km stretch. The minimum river flow is approximately 127 m^3/s. Therefore, there potentially exists a firm generating capacity of 28 MW over the entire length of the rapids.

The Saskatchewan Power Corporation has conducted a preliminary assessment of a small hydro plant located at one of the rapids. Considered in this report was the initial installation of a 500 kw generator with provisions made for an additional 50 kw generating capacity. The project, the preliminary planning stage, appeared to have mimimal effect on the surrounding landscape and existing watercourse.

1.3 Potential Sites Beyond 16 km Radius

Elizabeth Falls - Located on the Fond du Lac River between Black Lake and Middle Lake, this site, 19 km from the community of Stony Rapids, has significant hydro electric potential. The river falls an estimated 3.35 m over 5 km. The minimum unregulated flow (minimum daily discharge) is 127 m^3/s. Taking this into consideration, 36 MW of firm generating capacity would be available assuming an 80% generating efficiency. Saskatchewan Power has estimated that, if upstream regulation of the water level in Black Lake is utilized within its natural water level variation of 1 m, a minimum flow of 180 m^3/s could be obtained.

This site provides potential far beyond even the long term requirements of the local communities of Stony Rapids and Black Lake. In addition, Elizabeth Falls is considered a significant natural feature and tourism resource of the north. Initial investigations also indicate that the falls may be of substantial archaeological signifance. As a result, development of this site over the near term is unlikely.

Burr Falls: See Black Lake

Chipman River: See Black Lake

2.0 WOOD RESOURCES

Very little detailed data is available on the forest resources around Stony Rapids. Directly south, and throughout the community, is an extensive burnout area that extends to a portion of the shore of Black Lake. The eastern perimeter of this burnout area is the road connecting the communities of Black Lake and Stony Rapids. Partially burned or scarred Jackpine is the major wood available in the burnout areas. Stony Rapids has been utilizing standing fire kill material from this area for about the last 8-10 years. As a result, while plenty of wood is available, residents must travel increasingly farther from the community and service roads. Discussions with resource officers indicate that very significant long term wood resources still remain in the extensive burn area. More detailed study would be required to assess the ability of the wood resource base to support an additional large scale wood consumer such as a wood fueled electrical generation plant.

3.0 WIND RESOURCES

Very little data is available on the wind characteristics of this location. General observations of global wind patterns indicate that during the winter months, the westerly flow of winds shift south, subjecting the northern areas of Saskatchewan to frequent periods of calm. Further investigation of the microclimatic factors surrounding the community, (including significant togographical features), would be required to establish the potential for wind at this site. The closest weather station that is able to monitor wind characteristics is at Uranium City. A wind monitoring station has also recently been created at Wollaston.

Wollaston Lake

REMOTE COMMUNITY ANALYSIS

I. COMMUNITY PROFILE

WOLLASTON LAKE

STATUS:

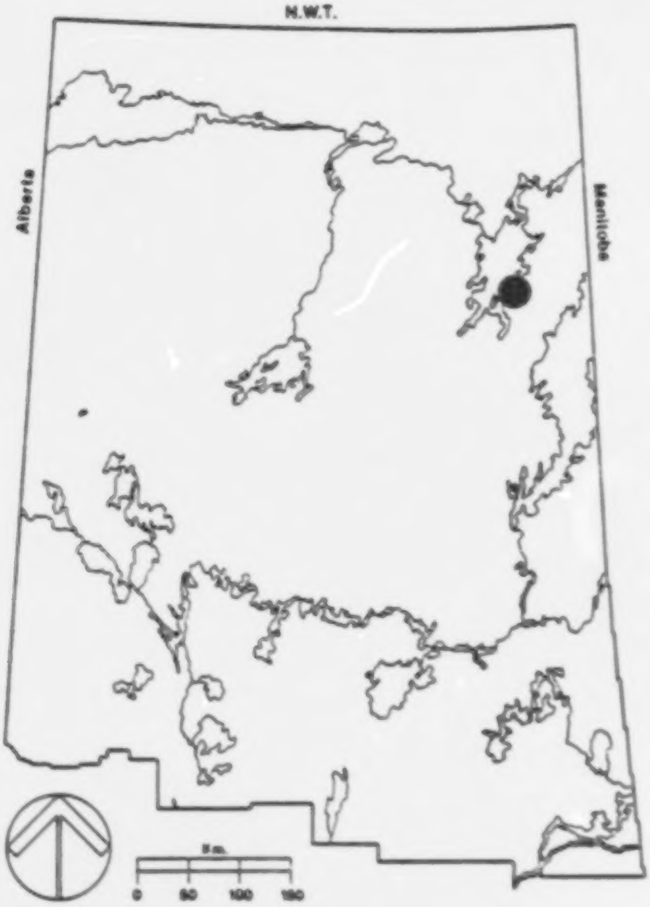
L.A.C. & Indian Reserve

Lac La Hache Band #220

LOCATION:

Lat: 58° 07'

Long: 13° 10'



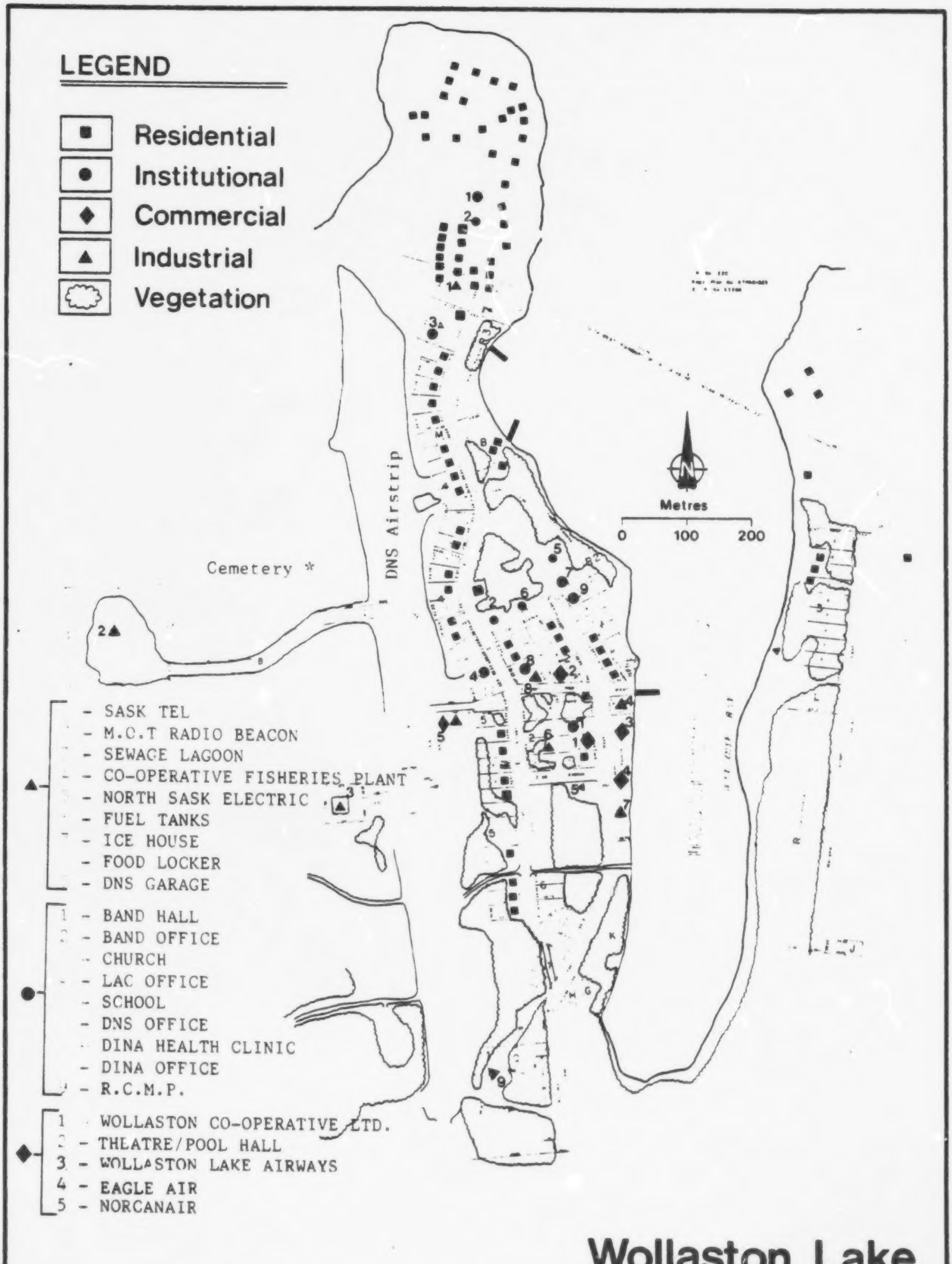
Source of Information:

Publications and Articles

Northern Saskatchewan Community Directory, August 1981.
Institute of Northern Studies, Settlements of Northern Sask.
Wollaston Lake, Community Planning Study, Damas & Smith Ltd., December 1981.

Interviews and Correspondence

Richerd Hankinson/Helmuth Knaus - D.I.A.N.D., Prince Albert District Office, January 1983.
Cal McLachlan, Manager, North Sask Electric Ltd., La Ronge, January 1983.
Brian Ritchie, Capital Co-ordinator, Northern Lights School Division, Prince Albert, January 1983.
Larry Evans, Manager, Sask Housing Corp., Northern Department, January 1983.
David Klippenstein, Underwood McLellan Ltd., January 1983.
Resource Officer, Wollaston Lake, February 1983.
Bert Coen, Manager Co-op Store, Wollaston Lake, February 1983.
Jim-Olson, Eagle Air, Wollaston Lake, February 1983.
L.A.C. Office (Terry Daniels), Wollaston Lake, February 1983.
Harold Brunning, La Ronge Propane, La Ronge, February 1983.


LEGEND
■ Residential
● Institutional
◆ Commercial
▲ Industrial
Vegetation
DNS Airstrip
Cemetery *
Metres
0
100
200
N

▲
- SASK TEL
- M.O.T RADIO BEACON
- SEWAGE LAGOON
- CO-OPERATIVE FISHERIES PLANT
- NORTH SASK ELECTRIC
- FUEL TANKS
- ICE HOUSE
- FOOD LOCKER
- DNS GARAGE

●
1 - BAND HALL
- BAND OFFICE
- CHURCH
- LAC OFFICE
- SCHOOL
- DNS OFFICE
- DINA HEALTH CLINIC
- DINA OFFICE
- R.C.M.P.

◆
1 WOLLASTON CO-OPERATIVE LTD.
- THEATRE/POOL HALL
3 - WOLLASTON LAKE AIRWAYS
4 - EAGLE AIR
5 - NORCANAIR

Wollaston Lake

Source: 1:8000 Air Photo's June 81, DNS Community Planning Plans

A. HISTORY AND GROWTH (L.A.C.)

1. Community Established 1940's with establishment of government trading post and fish packing on Moose Island.
2. Demographics:

Present Population 159 - SHSP Statistics

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total) (additional information not available)								135	134	138	159

Growth % DNS community planning projects (4%) growth

Projected Future Population Growth 1986 - 189 persons

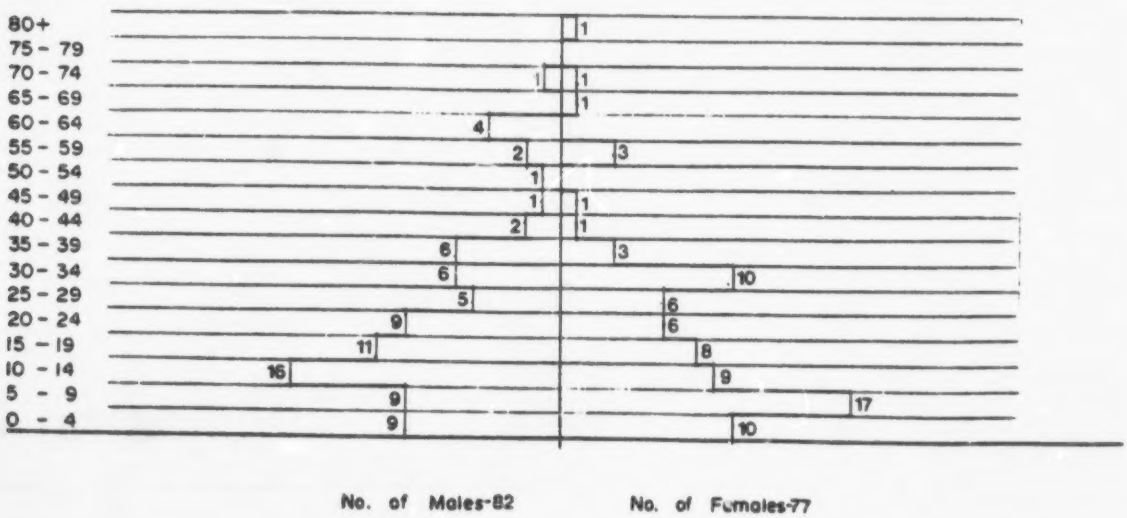
1991 - 227, 1996 - 273

Ethnic Mix: White X %

Metis X %

Indian %

Other % Cree & Chipewyan Decent


Age-Sex Structure

A. HISTORY AND GROWTH (Reserve)

1. Community Established In 1950 the Chipewyan constructed a chapel and several cabins.

2. Demographics:

Present Population approximately 384 persons of which 229 live on Reserve land and 155 live within the LAC boundaries.

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Population (total)			283	300	317	335	353	353		384	
Growth %	5 - 6% growth										

Projected Future Population Growth Damas & Smith Report

@ 5% 1986 - 490 persons, 1991 - 630, 1996 - 810

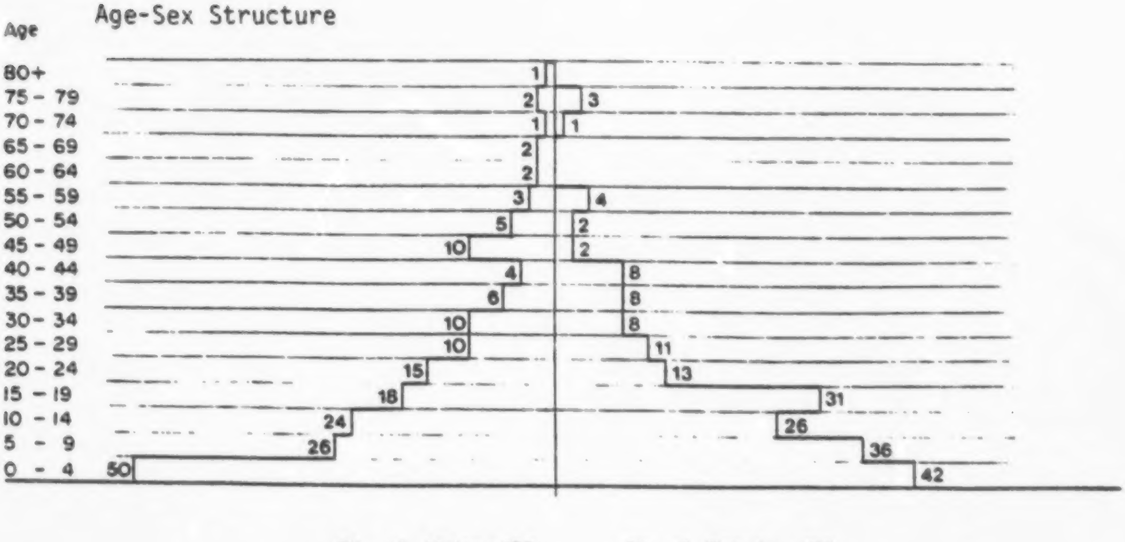
Ethnic Mix: White ____ %

Metis ____ %

Indian 100 % (Chipewyan)

Other ____ %

Age-Sex Structure



B. Community Services

1. Water

Source		Distribution		Serving		Treatment	
Lake	X	Pipe	X	Government Buildings	X	Sedimentation	
Stream		Truck		Commercial Buildings	X	Filtration	X
Wells		Individual Systems	X	Residences		Chlorination	X
Other		None		Standpipes		Flouridation	
						None	

2. Sewage

Collection System		Serving		Disposal	
Pipe	X	Government Buildings	X	Lagoon	X
Truck		Commercial Buildings	X	Septic Tanks	
Individual Systems		Residences		Treatment Plant	
None				None	

3. Solid Waste Disposal

Garbage Collection Organized X Yes ___ No (intermittent)

Landfill Site Utilized X Yes ___ No

Other Methods of Disposal ___ Yes X No

4. Fire Protection Organized ___ Yes X No

Equipment ___

5. Police Protection - R.C.M.P. ___ Yes X No

Patrolled from La Ronge

C. Community Facilities (L.A.C. and Reserve)

1. Health

Clinic in Community X yes ____ no

Size of Facility Hospital $241 m^2$

Outpost Hospital ____ yes X no

Served By ____

Staff ____ Doctors 2 Nurse 1 Other (Community) Health Worker)

Doctor visits every second week.

2. Education Northern Lights School Division

School located in community X yes ____ no Atco Trailers 1966 68, 70, 74, 76, 79 and 80.

Kindergarten - Grade 9 Size 1170 sq. m. Classrooms 7 plus 1-libary Home Ec., DNS Maintenance staff headquarters, Industrial Arts.

Teacherages: Size ____ sq. m. 7 teacherages (1 duplex, 2 houses, 3 trailers

Students 185 - 132 treaty, 53 non-treaty - 12 staff.

3. Residential

(1) Number of houses in community 91 (13/DNS Houses 1974-75

(2) Number of houses with sewer and water 0%

(3) Number of houses with power hook-up 100%

(4) Housing condition: Good 29/91 (32%)

Fair 12/91 (13%) Poor 50/91 (55%) Damas/Smith

(5) Number of houses constructed annually 9 size varies

(6) Heat Source wood primarily

(7) Cooking wood - some propane

(8) Housing construction notes: Varies, 71/91 (78% detached) Supplied by DIAND and DNS 2/91 (2% duplex) 6/91 (7%) trailers 14/91 (15%) shanties or other.

4. Community Buildings

	Type/Use	Size		Type/Use	Size
1.			4.	Walk in Freezer	31.2m^2
2.	Warehouse	53.5m^2	5.	Band Office	89.2m^2
3.	Community Centre	784.5m^2	6.	Co-op Store (3 buildings)	277m^2

5. Other Institutional/Commercial/Industrial Facilities (private, etc.)

	Type/Use	Size		Type/Use	Size
1.	L.A.C. Hall and Office	178.37m^2	5.	Sask Tel	33m^2
2.	Church	N/A	6.	MOT	22m^2
3.	R.C.M.P.	100m^2	7.	D.N.S.	75m^2
4.	Norcanair Air	45m^2	8.	D.N.S. Resource	180m^2
			9.	Wollaston Lake Air	36m^2
			10.	Eagle Air	45m^2

D. Economic Activities

Agriculture		Hunting	X	Trapping	X
Fishing	X	Mining	X	Transportation	
Forestry		Tourism		Service Centre	X

Other ____________________

E. Communications and Transportation Links

(1) Post Office X yes ____ no ____ located in LAC Office

Television X yes ____ no ____ source & no. of stations

Radio ____ yes ____ no ____ source & no. of stations

Telephone ____ yes ____ no

____ individual ____ community

____ local ____ long distance (information not available)

High Frequency Radio ____ yes ____ no

operated by ____________

F. Transportation Links

1. Access to Community by Scheduled Services

	Carrier	Frequency	Origin
Air	Norcanair	Scheduled Flight once a week	South
Truck	Winter road only		
Bus	No		
Other	Barge (Summer)		

2. Local Transportation for Visitors

Taxi _____ yes X no _____

Rental Vehicles _____ yes X no

Charter Aircraft X yes _____ no _____

3. Local Transportation - by Community

	Yes	No	Type
Boats	X		
Snowmobiles	X		
Cars	X		
Heavy Vehicles			L.A.C. has grader, Band truck
Other		X	

G. Notes: Regarding historical growth of community.
Social composition and decision-making.
Past and future socio-economic trends.

Because the community is relatively isolated, transportation is crucial. At present the summer barge is inefficient and winter road is only for a short seasonal time period. Excellent forestry resources in and around community for local use as firewood. New school is being proposed.

Wollaston will become incorporated as a northern hamlet under the proposed Act.

H.1

Diesel Electric Generation

1. Location: WOLLASTON[1]
2. Owner: North Sask Electric
3. Diesel Type: 2-250 KW; 1-300 KW
4.

Customers 1981	Number	1981 Consumption (KWH)
Residential	77	412,651
Commercial	8	77,155
Government	16	316,048
Street Lights	2	10,223
Total	103	816,077

Average Residential Consumption 446.6 kWh/Mo (1981)

Diesel Fuel:

	1981	1982	1983
Cost $	0.296	0.311	0.2852
Annual Fuel Use Litres	347,120	381,835[2]	420,000[2]
KWh/litre fuel	2.4		-
Fuel cost increases over previous year (%)	+38.6	+5.1	-8.3

Fuel Storage Capacity (9 x 22,730) + (2 x 45,460)= 295,490 litres

Peak Load 180 - 200 KW

Forecast Peak Loads:

1981 200 kW; 1982 250 kW; 1983 280 kW;

1984 320 kW; 1985 350 kW

Notes:

[1] Source North Sask Electric

[2] Estimate based on 10% fuel usage increase p.a.

H.2 ENERGY PROFILE - ANNUAL CONSUMPTION - WOLLASTON

	Annual Energy Consumption			
Classification	Electricity (MWH)	Fuel Oil (x 10^3)L	Propane (x 10^2)L	Wood (Cords)
Education	103	90	100	--
Health	20	11	--	--
Protection	15	--	210	--
Communications	186	--	--	--
Transport Services	--	--	--	--
Government	38	22	4	--
Community Services	120	48	--	5
Commercial	77	17	15	10
Residential	413	68	--	560
Total	972	256	329	575

H.3 ENERGY PROFILE - SOURCE FUEL CONSUMPTION

	Annual Source Fuel Consumption - Basis 1982 Facilities				
Classification	Electricity[1] (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	1,661	3,483	272	--	5,416
Health	323	426	--	--	749
Protection	242	--	571	--	813
Communications	2,999	--	--	--	2,999
Transport Services	--	--	--	--	--
Other Government	613	851	11	--	1,475
Community Services	1,935	1,858	--	82	3,875
Commercial	1,242	658	41	164	2,105
Residential	6,660	2,632	--	9,184	18,476
Total	15,675	9,908	895	9,430	35,908

1. Lists the consumption of source fuel (usually fuel oil) required to generate electrical energy, and uses an average performance index of 2.4 kwh/litre of fuel.

I. ASSESSMENT OF RESOURCES

1.0 POTENTIAL SMALL SCALE HYDRO ELECTRIC SITES

1.1 Background

There are no significant topographical or hydrological features to indicate small hydro-electric potential within a 16 km radius of Wollaston.

1.2 Sites Within a 16 km Radius

None.

2.0 WOOD RESOURCES

No detailed information is available on wood reserves surrounding the community of Wollaston. Saskatchewan Power Corporation has made a very general estimate that 289,000 - 2,025,000 cords are available within a 19 km radius of the community. Major species found in the area are jackpine, black spruce, birch, aspen and tamarack.

The vast majority of homes in Wollaston utilize inexpensive tin woodstoves for home heating. Green, freshly cut wood is burned in all cases.

Generally, wood is collected in a 3-4 km radius of the community (mostly softwoods) and along the winter road which passes over a number of islands on Wollaston Lake (birchwood most often collected). A large burn area exists about 10 km south of the community, however no harvest presently takes place in this area.

Large sized material, considered good for burning, is becoming scarce within a 1-2 km radius of the community. Some residents have commented that one has to spend so much on gas to harvest good wood (located further from the community), that it is almost worthwhile to burn oil instead.

3.0 WIND RESOURCES

No data is presently available on the wind characteristics at this site. In a report prepared for Saskatchewan Power Corporation by the Saskatchewan Research Council,* a site 800 m west of the south end of the airport, on a hill overlooking Wollaston Lake, was identified as having site characteristics favourable to wind power utilization. A station to monitor wind conditions has just been established. However, it will be a number of years before sufficient historical data exists to allow an assessment of wind potential.

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* Bergstreinsson, J. L., Initial Screening of Wind Power Sites. Prepared by the Saskatchewan Research Council for Saskatchewan Power Corporation, February 1979.

APPENDIX I

SMALL SCALE AND MICRO HYDRO

APPENDIX I

SMALL SCALE AND MICRO HYDRO

1.0 Description

This section of the report examines the technology involved in the utilization of small scale hydro-electric potential for remote communities. Hydro-electric applications have traditionally been classified in three categories.

- Micro Hydro	capacity of 100 kw or less
- Small Hydro	capacity of 100 kw - to 10 mw
- Medium to large Scale Hydro	Capacity of 10 mw +

Micro hydro and small hydro are most applicable to the communities under study. While there are opportunities for large scale hydro-electric development in the north (notably Elizabeth Falls and Tanzin Lake), their application will not be examined in this report. Such developments require teams of specialists for feasibility study, engineering and planning.

Micro and small hydro technology is significantly different from large scale applications. Generating plants are often prefabricated and can easily be trucked or flown into a site. In many cases only minimal modification of a rivercourse is necessary in order to divert the stream flow into a pipeline (or penstock).

While the actual design of a hydro plant may vary according to the site and hydrological characteristics present, other requirements for a development may include a canal or forebay; trashracks to filter debris and prevent it from being drawn through the turbine; and a pipeline gate or valve.

2.0 Assessing Hydro-Electric Potential

The 'data summary' presented in a separate volume of this report identifies a number of hydro-electric sites in close proximity to various northern communities. Potential is determined by three factors:

- Water Flow (Q) - the quantity of water flowing past a given site;
- Available Head (H) - the vertical height or drop that may be utilized by a hydro-electric system;
- Generation Efficiency (e) - the ability of the power plant to utilize available head and flow. Plant efficiencies can range from 25-90% depending on the type of plant installed. Typically smaller scale technology is less efficient.

The "firm generating potential" of a watercourse in kilowatts (P) can be determined as follows:

$$P = \frac{Q \times H \times e}{102}$$

where

Q = the usable waterflow that may be diverted to a turbine (in litres per second)
H = the available head (in metres)
e = the overall power plant efficiency
102 = a derived constant

Firm generating capacity is usually based on the minimum annual waterflow (minimum daily discharge) for a particular site. This is usually obtained from historical streamflow data. An estimate of firm generating capacity is also dependent on an accurate estimate of usable head. Firm generating capacity is defined as the power (in kilowatts) that a particular site is capable of producing on a firm and sustained basis.

3.0 Turbines for Hydro-Electric Generation

A turbine converts the energy available in the watercourse into useful mechanical energy, which is subsequently converted to electrical power. In remote communities where electrical supply will necessarily be independent of the electrical grid, a governor on waterflow through the turbine, in conjunction with a synchronous generator, should be utilized.

This ensures that a steady and dependable flow of electricity (at 60 cycles per second) is maintained. A variation in an alternating current generation from 60 cycles will affect the operation of conventional electrical appliances.

There are three basic types of turbines.

3.1 Impulse Turbines

The 'Impulse' type turbine entails the same operating concept as does a water wheel, in that it employs a jet or jets aimed at buckets around a wheel. The energy of the water is first converted into a high velocity jet of water through a nozzle at the end of the penstock; the impact of this jet on the bucket turns the wheel. As impulse turbines are generally suited to developments with over 100 metres (325 feet) of head, they are not appropriate for any of the communities under consideration.

3.2 Reaction Turbines

A 'Reaction' type turbine is one in which the entire flow system is closed and under pressure. Reaction turbines are of two sub-types: mixed-flow or propeller.

In the mixed-flow reaction type turbine, the flow enters radially and exits axially through the turbine. Both horizontal and vertical shaft arrangements are possible. The most common mixed-flow reaction type turbine is the Francis turbine. Francis turbines cover the head range from 10 to 250 metres with capacities of 100 to 2000 kw in the small hydro range. Figure 1.1 illustrates the basic features of a Francis turbine.

The propeller reaction type turbine is so called because it employs a propeller type of rotating runner, the blades of which may be fixed or variable pitch. The variable pitch propeller reaction type turbine is known as the Kaplan turbine.

Other variations of the propeller reaction turbine are known as Tube, Bulb or Rim turbines. Propeller reaction turbines cover the head range from 3 to 20 metres with capacities of 100 to 2000 kw in the micro hydro range. Figures 1.2 to 1.5 illustrate the basic features of Kaplan, Tube, Bulb and Rim turbines, respectively.

3.3 Banki or Cross-Flow Turbines

The Banki or cross-flow turbine operates by admitting water through a rectangular inlet and guide vane control system to the runner blades. Water first passes radially from the outside to the inside of the runner across the blades and then from the inside of the runner across the blades to the outside at atmospheric pressure. The principal manufacturer of cross-flow type turbines is Ossberger of Germany. They cover heads from 2 to 170 metres (6 to 500 feet) with outputs of 50 to 1000 kw. Figure 1.6 illustrates the basic features of the cross-flow turbine.

Figure 1.1

Horizontal Francis Turbine

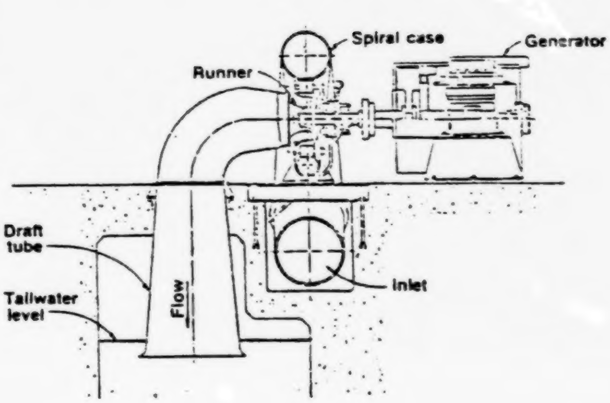
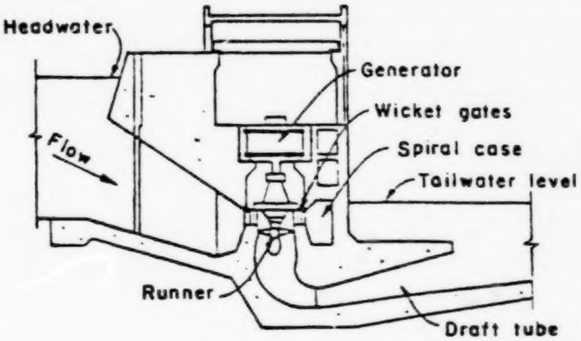

Spiral case
Generator
Runner
Draft tube
Tailwater level
Flow
Inlet

Figure 1.2

Bulb Turbine


Headwater
Generator
Wicket gates
Spiral case
Tailwater level
Flow
Runner
Draft tube

Source: Crippen Consultants
Vancouver, B.C.

Figure 1.3

Tube Turbine

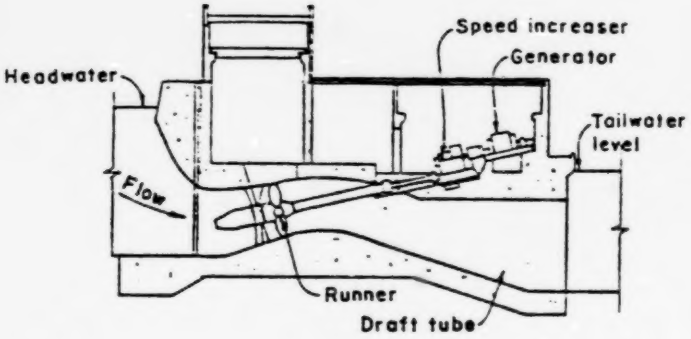

Speed increaser
Generator
Headwater
Tailwater level
Flow
Runner
Draft tube

Figure 1.4

Bulb Turbine

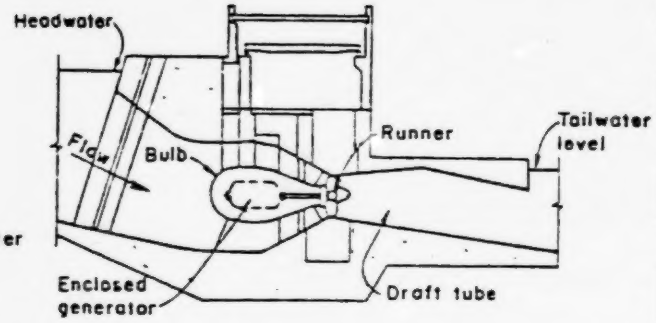

Headwater
Runner
Tailwater level
Flow
Bulb
Enclosed generator
Draft tube

Figure 1.5

Rim Turbine

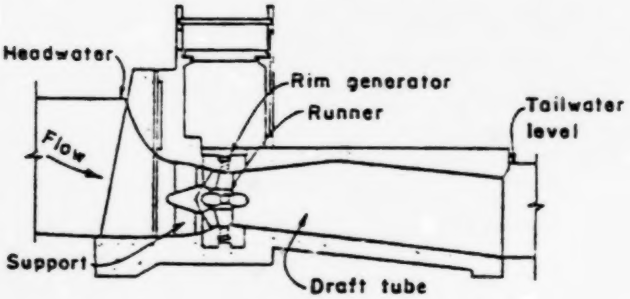
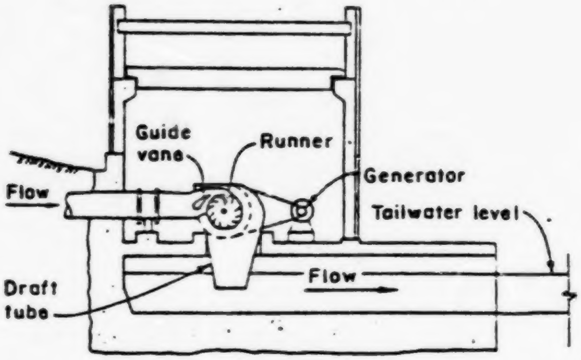

Headwater
Rim generator
Runner
Tailwater level
Flow
Support
Draft tube

Figure 1.6

Cross Flow Turbine


Guide vane
Runner
Flow
Generator
Tailwater level
Flow
Draft tube

Source: Crippen Consultants
Vancouver, B.C.

The selection of the most appropriate turbine is based on factors such as load pattern, operation and maintenance characteristics, economics and availability. Availability is often a critical factor since lead time for delivery of turbines is 9 to 12 months at best.

4.0 Economics

The cost of a hydro-electric installation is dependent on a wide range of variables. They include the site topography, availability of suitable equipment and financing applied to the project. The cost of small scale hydro developments are quite high and can range from $4,000 to $5,000 per installed kilowatt capacity. To some degree, these high costs are compensated for by low and stable operating costs, however, fixed costs of interest and depreciation can create significant overall deficits in early years. Likewise, the cost of transmission lines are affected by high capital and financing costs and low operating costs. Properly financed, usually over a 25-50 year period, hydro-electric development tend towards breakeven operation over the long term.

A preliminary study conducted by Saskatchewan Power Corporation into hydro development on Woodcock Rapids, near Stony Rapids, estimated that a 5 MW plant would cost around $3,000 per installed kilowatt capacity.* The plant was envisioned to supply electrical power to the communities of Fond du Lac, Stony Rapids, and Black Lake. Saskatchewan Power Corporation has also carried out preliminary engineering investigation of the installation of a 1 MW plant at the same site. No cost estimates however are available at this point in time.

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* Saskatchewan Power Corporation Northern Hydro Development, Economic Feasibility of Small Hydro Development in the Black Lake Area.

Generally speaking, small hydro-electric developments below 20 MW are comparatively high in installed cost per kilowatt, particularly in lower head ranges, where dam construction and watercourse diversions are necessary. This is primarily due to the disproportionally high fixed costs of access roads and construction services. In small hydro applications, these costs represent a much higher percentage of total costs in comparison to large scale developments. Even in situations where a generating station can be located at a concentrated fall site, where a dam is not required, construction costs, under the best conditions, will equal generating equipment cost.

Saskatchewan Power Corporation has estimated that the cost to add additional capacity to existing diesel generations is approaching $500 per kilowatt. Considering this, plus the high cost of diesel operation (fuel costs alone for Stony Rapids diesel generation are approximately $300,000 for 1982), the amortized high initial cost and low operational costs, in the wake of rising fuel cost, makes hydro a very attractive alternative.

No estimates of capital, operating or life cycle costs are presented in this report due to the variation in site specific cost variables that is likely to occur from site to site.

APPENDIX II

WOOD CONVERSION TECHNOLOGIES

APPENDIX II

WOOD CONVERSION TECHNOLOGIES

1.0 Introduction

Wood, one of the few readily accessible and indigenous energy resources of northern Saskatchewan, is used extensively for direct space heating, water heating and cooking in the remote communities of Saskatchewan. Estimated volumes of consumptions per community range from 150 to 600 cords per year. The popularity of wood as a fuel resource, needless to say, is directly proportional to the price of hauled fuels (fuel oil, propane). These same economic considerations may apply to larger scale fuel consumers. For example, 50-85 percent of the total energy input into the study communities is for electrical generation.

This chapter examines the technology involved in generating electricity from biomass feedstocks. Three specific technologies have been identified as suitable for application in remote communities, based on the development stage of the technology, scale of operation, economics and level of on-site expertise required.

The three methods that are most suited to wood-electric conversion in remote communities are listed below and will be discussed in greater detail in following sections:

- Boiler/Steam Turbine
- Boiler Steam Engine
- Gasification/Internal Combustion Engine

Another technology applicable to remote communities, though not as of yet developed to the commercial stage, is the gasification turbine. Hot air or gas produced by a gasification plant is utilized to turn a turbine, which in turn powers an electric generator. In the limited amount of research conducted to date, impurities in the gas produced have been found to corrode traditional turbine materials. Research is ongoing and full commercial development is not expected over the near to mid-term.

1.1 Wood Processing

All three technologies examined in this chapter have similar requirements in terms of the harvesting and processing of the wood feedstock. Necessarily, the methods utilized are significantly different than those currently practiced in the communities.

Fuelwood harvest, as presently practiced in Saskatchewan communities, involves use of small scale equipment (pickups, snowmobiles and dogsleds) at periodic intervals. Fuelwood gathering is for the most part, an unorganized activity. However, in some communities a formal process of fuelwood cutting and delivery is carried out for senior citizens for a nominal fee (approximately $35/cord).

1.2 Harvesting

While there are a number of harvesting techniques that may be applied in and around the study communities, the most appropriate approach would appear to be the labour intensive shelter, wood logging system. This process involves selectively cutting mature trees within forest stands leaving smaller trees to stand undisturbed.

Because large dominant trees are now gone, more nutrients, water and sunlight become available to the small trees. Generally, growth rates can be increased. Stands harvested by this method have been found to regenerate themselves after such a disturbance, maintaining good biomass volumes.

A second advantage to this harvesting method, is that it utilizes small scale, readily available equipment and is labour intensive (providing good opportunity for local employment). Selected trees are cut by chainsaw into 1.2 m lengths, piled in rows and then hand-loaded onto sleighs. During the winter, local waterways can be used to haul the loaded sleighs by crawler tractor to the community. There is also a possibility that trees could be rafted together on the ice and subsequently towed to the community after spring thaw. This latter method, however, requires the availability of large timber to make boom timbers and large boats capable of pulling the large rafts.

1.3 Feedstock

Most boilers for steam turbine and wood gasification systems require small-sized feedstock (generally less than 3 cm in size). Wood can be reduced to burnable size by chipping equipment. Portable chipping equipment is available that provides an option of preparing wood at the harvest site or at the community. Chipping technology is widely used in the forest products industry for pulp and paper and composite board manufacturing processes.

Lengths of wood up to 1.2 m may be used in some boilers utilized to power steam engines. These boilers tend to have lower efficiencies and produce a lower pressure steam. Overall electrical generation efficiencies can be very low with such systems.

Wood, in chip form, is difficult to handle manually; therefore, automated wood handling, storage and feeding is necessary. Chips can be stored in elevated bins or in underground storage areas where freezing of the chip material can be prevented. Overall efficiencies can be increased if the chip material is dried. Chips normally have a 50-60 percent moisture content. Excess heat from the generating process can be used to dry the chips before it is burnt or gasified. Drying of the wood chips to at least 20 percent moisture content is absolutely necessary in gasification, to ensure proper operation of the system.

2.0 Boiler/Steam Turbine

2.1.1 Description

In a boiler/steam turbine system, wood, usually in chip form, or in some cases in gasified form, is used to fuel a steam boiler. The steam produced is then fed through a steam turbine. The rotational energy of the turbine is subsequently used to turn an electrical generator. This system is commonly used in large thermal electric generating plants, large pulp mills and is at times used as a back-up generating system in some hospitals.

Boiler/steam turbine technology for small scale applications (ranging from 100-1000 kw) is fully developed and readily available. The turbine and generator are usually sold in a combined package. The generator is identical to the type used in diesel-electric generation.

It is highly unlikely that there will be a suitable direct user for the steam after it travels through the turbine. As a result, the steam must be condensed back into water. A simple steam condenser utilizes cold water to transform the steam back into water which can then be recycled through the steam production process again. Low grade heat recovery can also be integrated into the condenser design.

Because the kind of steam boiler required for turbo-electric generation must produce well in excess of 160 psi of steam pressure, the Steam, Boiler and Pressure Vessels Act of Saskatchewan requires that a stationary engineer be on duty at all times. If the system were to operate at 24 hours per day, at least 4 full-time engineers would be required. This single factor adds considerably to the cost, as discussed later.

2.2 Fuel Requirements

In terms of fuel requirements, a 100 kw system operating at a 50 percent load factor would use 549 cords of mixed hardwoods and softwoods per year. This is assuming that heat content of a cord of wood, dried to 20 percent moisture content is 16.4 (GJ/cord). Table 2.1 summarizes the assumed fuel requirements of a range of sizes of turbo steam plants, given the above assumptions.

Table 2.1

Annual Fuel Requirements for a Boiler/Steam Turbine Electrical Generation Plant

Capacity of Plant	Load Factor	Fuel Requirement
100 kw	50%	549 cords/year
200 kw	50%	1098 cords/year
300 kw	50%	1647 cords/year
400 kw	50%	2195 cords/year
500 kw	50%	2745 cords/year
800 kw	50%	4392 cords/year

If the wood utilized is higher in moisture content than 20 percent, additional volumes of wood will be required.

2.3 Economics - Steam Turbine

2.3.1 Introduction

The economics of the boiler steam turbine plant is evaluated from three perspectives. Economic assessments are based on previous work conducted by Middleton Associates and are based on rough estimates of capital and operating cost.* Costs may vary with site and application. Considered in this section are the economics of a boiler steam system based on:

- estimated installed capital cost,
- estimated annual fuel and maintenance costs,
- life cycle costs.

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* Middleton Associates.

2.3.2 Estimated Installed Cost

Table 2.2 summarizes the estimated capital costs of the major operating components of a 100 kw system with a diesel engine backup in 1982 dollars.

Transportation costs are not included in this assessment because of their variability, depending on size of unit selected and candidate community. The most economical transportation to the majority of sites considered in this study is by all-weather or seasonal road. Transport costs by tractor trailer to northern settlements can range from $1.50 to $2.50 per kilometer.

For those sites not accessible by road (the Athabasca communities of Camsell Portage, Fond du Lac, Stony Rapids and Black Lake), the cheapest method of transport is presently by barge. Costs for barge transport of bulk petroleum products from Fort McMurray to Uranium City or Stony Rapids ranges from $50.60-$66.20 a ton. At this time, however, the future of barge service from Fort McMurray to the Athabasca communities is in question due to the decommissioning of the uranium mines in Uranium City.

Air freight costs to the Athabasca Region (Stony Rapids) from La Ronge are in the range of $1.20 to $1.50 per kilogram.

The following equipment costs are based on conversations conducted by Middleton Associates during 1982 with selected industry representatives.

Table 2.2

Approximate Capital Cost of 100 kw Wood Fueled Steam Turbine Electrical Generation System

	Components	Equipment Cost ($1.0 x 10^3)	Installation Cost ($1.0 x 10^3)	Total Cost ($1.0 x 10^3)
1.	Wood Storage Bunker	15	15	30
2.	Wood Chipper	20	3	23
3.	Chip Handling Storage Fueling System	60	20	80
4.	Wood Combustion Unit and Boiler	150	50	200
5.	Back-Up Diesel Engine	103	5	108
6.	Steam Turbine and Electric Generator	150	60	210
7.	Steam Condenser	80	4	84
8.	Building	50	50	100
9.	Water Supply	1.5	8	9.5
	Total	629.5	215	844.5

Source: Middleton Associates et. al., Assessment of Alternative Generation Technologies Phase II. Prepared for the Kayahna Tribal Council, Ontario Ministry of Energy and Energy Mines and Resources, Canada, September 1982.

2.3.3 Estimated Annual Fuel and Maintenance Costs

Table 2.3 presents the estimates of ongoing costs associated with harvest, transporting and chipping the required wood fuel for a 100 kw system. The time component for labour is calculated, but no dollar value has been assigned.

Table 2.3

Annual Fuel and Maintenance Costs for a 100 kw Wood Fueled Steam Turbine Electrical Generation System

	Expense Item		Components/Assumptions	Cost Per Cord
1.	Labour	1.1	Harvesting	1 man day
		1.2	Transportation	.75 man day
		1.3	Preparation/storage	.25 man day
2.	Fuel	2.1	Harvest: 6.8 litres/cord @ $0.60/litre (gasoline)	$ 4.08
		2.2	Transportation: 50 km round trip @ $0.48/litre 1.8 km/litre (fuel Efficiency) @ 4 cords/trip	$ 3.33
		2.3	Preparation: 7 litres/cord @ 60¢/litre (gasoline)	$ 4.20
3.	Equipment	3.1	Harvesting: 4 chain saws @ $250 each 550 cords/year x 2 year lifetime	$ .91
		3.2	Transportation: $1000/vehicle/year 550 cords/year	$ 1.82
		3.3	Preparation: 20 chipper knives/year # $35/knife 550 cords/year	$ 1.27
	Sub Total:		Cost Per Cord	$ 15.61
4.	Engineering Supervision			
		4.1	Personnel (including general maintenance) 4 Stationary Engineers @ $25,000 per year (estimate) 550 cords/year	$181.82
	Total Estimated Cost/Cord (not including Harvest Labour)			$197.43

Table 2.4

Summary of Cost Components and Life Cycle Cost of Various Wood Fueled Steam Turbine Electrical Generators (in 1983 $)*

Plant Capacity	Capital Cost	Annual Fuel Requirement (Cords)	Annual Fuel and Maintenance Cost		
			Harvest and Equipment	Engineering Staff	Life Cycle Cost (15 Years)
100 kw	844	549	52.5	100	3,131
300 kw	2,532	1,647	157.5	100	6,394
500 kw	4,229	2,745	262.4	100	9,650
800 kw	6,752	4,392	419.9	100	14,550

---

* All dollar figures in $1,000.

As can be seen from Table 2.3, the cost component for the required stationary engineer supervision is the most significant cost associated with the plant. If the size of the plant were tc double, triple, etc., all costs can be expected to follow suit except that of the engineering staff which would remain constant.

2.3.4 Estimated Life Cycle Cost

Table 2.4 summarizes the cost components of various sized generating plants and projects a simple life cycle cost estimate over an operating period of fifteen years. Escalation and discount rates are assumed to be equal to the inflation rate.

Local labour costs for harvesting were assumed to be $5.00/hour for an eight hour day. A stationary engineer was assumed to earn roughly $25,000 per year and that four stationary engineers would be required.

3.0 Boiler/Steam Engine

3.1 Description

Much like the steam turbine, wood is used as feedstock to create steam, which is subsequently transformed into mechanical energy to generate electricity. In the case of a steam engine, steam is used to drive a piston engine similar to that used by the railways before the advent of the diesel locomotive. In fact, steam engines were commonly used in remote communities to generate electricity at the beginning of the century.

While a turbo-electric generator requires steam at pressures in excess of 250 psi, a steam engine can operate with steam delivered at pressures of 150-250 psi. Despite the lower operating pressures, it is still likely that the system will have to be operated by a stationary engineer. Again, the Steam Boiler and Pressure Vessels Act requires that a stationary engineer must be on duty at all times if boiler pressures exceeds 160 psi.

Manufacturers have claimed that there are a number of distinct advantages of a steam engine over a steam turbine, particularly as applied to remote locations. These advantages, though debatable, are as follows:

- Reliability - Because it operates at slower speeds (400 rpm vs 3500-4000 rpm), it is claimed the steam engine is less prone to failure.

- Simplicity - Because the steam engine can use lower pressures and more saturated steam, it requires a less sophisticated boiler.

- Non-continuous loads - The steam engine is more suited to discontinuous power loads.

Despite these purported advantages, a distinct disadvantage is the low efficiency of the steam engine (8 percent vs 25 percent for a steam turbine). The lower operating efficiency of the steam engine means that considerably more wood feedstock would be required to produce an equal amount of electrical energy generated by a steam turbine.

3.2 Fuel Requirements

If it is assumed that: the heat content of the feedstock is 16.4 GJ/cord; the boiler operates at 70 percent efficiency; and the steam engine operates at 8 percent efficiency in converting steam to electrical energy, a 100 kw system operating at a 50 percent load factor would require 1715 air dried (20 percent moisture content) cords of wood per year. Table 2.5 details the wood requirements for various sized plants.

Table 2.5

Wood Fuel Requirements for Various Steam Engine/ Electrical Generation Plants

Plant Capacity	Load Factor	Wood Fuel Requirement
100 kw	50%	1,715 cords
200 kw	50%	3,430 cords
300 kw	50%	5,145 cords
400 kw	50%	6,860 cords
500 kw	50%	8,575 cords
800 kw	50%	13,720 cords

3.3 Economics - Steam Engine

3.3.1 Estimated Installed Cost

Table 2.6 summarizes the estimated cost of the major components of a 100 kw steam engine electrical generator with a backup oil burner. Cost estimates are based on previous discussions conducted by Middleton Associates with selected industry personnel.* Figures are presented in 1982 dollars.

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* Middleton Associates et. al., Assessment of Alternative Generation Technologies Phase II, September 1982.

It is assumed that the boiler utilized can handle whole logs up to 1.2 metres in length. As a result, chipping equipment is not required.

Table 2.6

Estimated Capital Cost of a 100 KW Wood Fueled Steam Engine Electrical Generation System

	Equipment	Equipment Cost (thousands of $)	Installation Cost (thousands of $)	Total Cost (thousands of $)
1.	Wood Storage Building	--	20	20
2.	Wood Combustion Unit and Boiler	100	10	110
3.	Back Up Oil Burner	75	25	100
4.	Steam Engine and Electrical Generator	125	5	130
5.	Steam Condenser	80	4	84
6.	Water Supply	1.5	8	9.5
	Total	381.5	72	453.5

Transport costs are not included in the estimates provided in Table 2.6 but are discussed in Section 2.3.2.

3.3.2 Estimated Annual Fuel and Maintenance Cost

The cost estimates for fuelwood are based on Table 2.4. Fuelwood is estimated to cost $15.61 per cord before adding the labour component. The cost of maintaining 4 stationary engineers is assumed to be $100,000 per year. Labour charges for harvesting wood is assumed to be $5.00 per hour. Total costs associated with wood collection and system maintenance is estimated to be $263,000 per year for a 100 kw plant.

3.3.3 Life Cycle Cost

An estimate of the life cycle cost of various size plants has been made, assuming that a doubling of generation capacity will double equipment costs and fuel requirements. As in Section 2.3.4 the life cycle costs of the system are based on the assumption that the escalation rate and discount rate are equal to the general inflation rate. The system lifetime is assumed to be 15 years. Table 2.7 summarizes the life cycle costs.

4.0 Gasification/Internal Combustion Engine

4.1 Description

Gasification is a process whereby wood, peat or other organic material is heated in the absence of sufficient oxygen to allow for combustion. As a result a combustable gas is produced, that after cleaning, is suitable to fuel an internal combustion engine. Diesel generators already existing in northern communities can be converted to run on wood or peat gas with minor modifications.

Internal combustion engines, as currently fueled by diesel fuel or gasoline to produce electricity can be incorporated to use wood or peat gas in a number of ways. Systems can be designed so that: they specifically use the low energy content gasification fuel; a duel fuel system to use either wood gas, diesel, gasoline or a mixture of fuels is incorporated; or an existing engine may be modified.

Gasification processes generally operate at temperatures of 900^{0}-1200^{0}C producing a gas that, if necessary, can be stored (when clean). The gas typically has a heat content of 46 MJ/m^3. The gas usually contains a combination of methane, hydrogen and carbon monoxide. The gas is both highly flammable and highly toxic.

Table 2.7

Summary of Cost Components and Life Cycle Cost of Various Wood Fueled Steam Engine/Electrical Generators (in 1982 $)[*]

			Annual Fuel and Maintenance Cost		
Plant Capacity	Capital Cost ($1.0 x 10^3)	Annual Fuel Requirement (Cords)	Harvest and Equipment ($1.0 x 10^3)	Engineering Staff ($1.0 x 10^3)	Life Cycle[1] Cost (1982 $) ($1.0 x 10^3)
100 kw	453	1,715	164	100	4,413
300 kw	1,359	5,145	492	100	10,239
500 kw	2,265	8,575	820	100	22,375
800 kw	3,624	13,720	1,312	100	34,900

---

[1] Assumes a lifetime of 15 years.

The gas produced by a wood gasifier will contain impurities that must be removed before the gas can be used to fuel an internal combustion engine. Such clean up systems entail cooling, washing, filtering, and compressing the new gas before feeding it to the engine. Byproducts from the cleaning process such as tars and oils can be used to predry the feedstock before it enters the gasifier.

Water used to clean the gas can become slightly acidic and contain phenols as well as carbohydrates that require treatment and disposal in an appropriate manner. For installations in remote communities, where very limited water treatment facilities exist, a water treatment process may be required. Possible treatment options include aquatic plants, oxidation and biological treatment. One equipment supplier recommends that the need for a treatment system can be avoided by spraying the effluent into the gasifier's afterburner, where it is vaporized. This however, may create other environmental concerns.

Feedstock for a gasifier must be of a small size to allow for high temperatures necessary to produce gas. In addition, feedstocks must be low in moisture content (20-30%). As a result, the fuel must be stored and air dried or quick dried immediately prior to combustion. Many gasifiers can be designed to use excess heat and byproducts from the cleaning process to dry woodchips or peat, as part of an automatic feed mechanism.

Gasification systems have been utilized in various forms, and various locations over the past century and a half. For example, in the 1890's wood gas was commonly used as a fuel for gas engines, steam boilers, ceramic kilns, and metallurgical furnaces. Small mobile portable gasifiers were used extensively in Europe during and after the second world war to power a wide range of vehicles.

There are a number of types of gasifer designs available. Recent research and development efforts have concentrated on improving the efficiencies of the gas production process and improving the quality of gas produced. There are three types of gasifiers generally available. They are briefly described below.

4.1.1 Updraft Gasifier: This type of gasifier is the simplest of gasifier designs. While it performs quite efficiently, a major drawback to the design is that the gas produced has a very high tar content and must undergo extensive cleaning. Feedstock is fed from the top of the gasifier and gases produced are also drawn off the top of the combustion area.

4.1.2 Downdraft Gasifier: Downdraft gasifiers were the type most commonly used with vehicles during the Second World War. Feedstock is fed into the top of the gasifier. Air is injected above the combustion area and gasses are forced to the bottom of the gasifier unit. The lower portion of the gasifier is cooled so that tars and other particles of matter will condense out of the gas stream. The gas, with a minimum amount of cleaning, can be fed directly into an internal combustion engine. Generally, a gasifier/electrical generation system of this type can generate a maximum of 1 mw capacity. Updraft gasifiers, because of their simple technology and limited generating potential, are well suited for remote communities, sawmills, mining camps, etc. Saskatchewan Power has been involved in considerable research - focused on the use of downdraft gasifiers for northern communities.

4.1.3 Fluidized Bed Gasifier: Recently a great amount of interest and research has focused on this type of gasifier. Wood or peat feedstock is auger fed into an extremely hot inert mass of material such as sand which is suspended in a fast upward flow of gas. Wood, when it comes in contact with this hot bubbling sand is transformed to a gas in minutes rather than the hours it would take in a conventional gasifier. Because of its ability to transform large volumes of feedstock to gas in a short period of time, it is seen as the most appropriate gasifier technology for large scale biomass/electric conversion. Omni Fuels has developed a successful fluidized bed system currently in use at a plywood mill in Herst, Ontario.

Wood gasification offers a number of advantages over the steam related technologies previously discussed in this section.

- The technology is relatiely simple and does not require highly trained personnel to operate. Maintenance requirements and skill levels are roughly equivalent to that of operating a diesel plant.
- The cost of equipment required is considerably less and existing diesel generation equipment can be modified to run on gasified fuel.
- Wood requirements for a system would be roughly equivalent to that required for a steam turbine.

A downdraft gasifier can be expected to operate at about 70% efficiency. Taking into consideration a generator efficiency of 25% and a load factor of 50%, a 100 kw gasifier would require about 550 cords of wood per year. As a result, annual fuel utilization for various sized plants would be similar to that expressed in Table 2.1.

4.2 Saskatchewan Power Gasification Research

Saskatchewan Power Corporation has undertaken a study of wood gasification in northern communities. Table 2.8 summaries fuel

Table 2.8

Summary of Wood Fuel Requirements for Gasification/Electrical Generation Plants in Selected Northern Communities

Community	Wood Reserves Within 19 km Radius	50 Year Gasifier Consumption (Cords)	Average Annual Consumption (Cords)
Brabant Lake	400,000	19,000	380
Black Lake	330,000	55,000	1,100
Camsell Portage	330,000	19,000	350
Deschambault Lake	1,995,000	40,000	800
Fond du Lac	830,000	63,000	1,260
Kinoosao	330,000	14,000	380
Michel/Dillon	1,335,000	89,000	1,780
Patuanak	1,222,000	74,000	1,480
Pinehouse	1,209,000	74,000	1,480
Southend	467,000	55,000	1,100
Stony Rapids	330,000	76,000	1,520
Wollaston	330,000	85,000	1,700

Source: Saskatchewan Power Corporation The Social, Environmental and Resource Impact of Wood Gasification on Isolated Northern Communities, Enfor Project C-8(2).

consumption conclusions from the Saskatchewan Power Study including the percentage of wood reserves within 19 km that would be utilized over a 50 year period. Estimates of consumption are based on peak loading and assumes a 2% increase per year in population and consumption. These figures should be considered only general estimates. Detailed investigation of specific communities is necessary to determine the actual feasibility of a gasification project.

Saskatchewan Power Corporation has, over the past five years, been testing a number of sizes of gasifiers. A 50 kw unit (electrical output) has been tested in the resort community of Jan Lake and a 150 kw unit has been tested, modified and improved since 1978 in Hudson Bay.

4.3 Economics

4.3.1 Introduction

The economic assessment presented in the following sections is based on previous work conducted by Middleton Associates and should be considered only very rough estimates of cost.*

4.3.2 Estimated Installed Cost

Table 2.9 summarizes the estimated cost of the major components of a 100 kw gasification power plant.

4.3.3 Estimated Annual Fuel and Maintenance Cost

The costs associated with wood harvest and gasifier operation similar to that presented in Table 2.4 except that stationary engineer personnel are not required. Fuelwood costs are $15.61 before adding the labour component for harvest. Harvest labour is assumed to cost an additional $80 per cord, assuming a $5.00/hour wage. Total costs associated with wood collection and system maintenance is estimated to be $95.61 per cord or $14,342 per year for a 100 kw gasification plant.

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* Middleton Associates, Assessment of Alternative Generation Technologies. Prepared for the Kayana Tribal Area Council, et. al., September 1982.

Table 2.9

Estimated Capital Cost of a 100 kw Wood Fueled Gasifier/Engine Electrical Generation Plant

Equipment	Equipment Cost ($1.0 x 10^3)	Installation Cost ($1.0 x 10^3)	Total Cost ($1.0 x 10^3)
Wood Storage Bunker	15	15	15
Wood Chipper	20	3	23
Chip Feeding System	60	20	80
Gassifier/Generator	260	30	290
Building	30	30	60
Water Supply and Treatment	15	5	20
Total Installed Capital Cost	400	103	503

Source: Middleton Associates, Assessment of Alternative Generation Technologies. Prepared for the Kayana Tribal Area Council, et al., September 1982.

4.3.4 Life Cycle Cost

An estimate of life cycle costs for various size plants has been made using the same assumptions presented in Section 3.3.3. Results are presented in Table 2.10.

As can be seen from Table 2.10, the life cycle costs for a gasification plant are significantly less than a system dependent on a steam engine or steam turbine. This is primarily due to the fact that full time supervision of the plant by a stationary engineer is not required.

Table 2.10

Summary of Cost Components and Life Cycle Cost of Various Wood Gasification/Electrical Generation Plants (1982 $)

Plant	Capital ($1.0 x 10^3)	Annual Fuel Requirements (Cords)	Annual Fuel & Maintenance ($1.0 x 10^3)	Life Cycle Cost (1982 $ x 10^3)
100 kw	503	550	53	1,298
300 kw	1,509	1,650	158	3,879
50 kw	2,515	2,750	263	6,460
800 kw	4,024	4,400	420	10,324

APPENDIX III

WIND/ELECTRIC CONVERSION SYSTEMS

APPENDIX III

WIND/ELECTRIC CONVERSION SYSTEMS

1.0 Overview

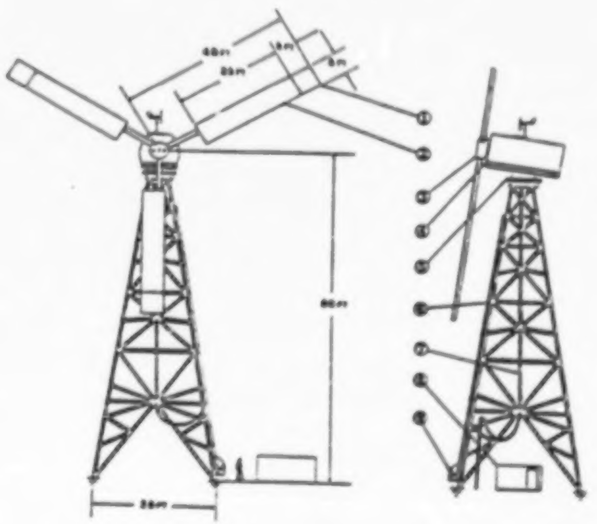
Wind is often considered a significant source of untapped energy. Unfortunately the wind does not blow with the same intensity at all times. Northern Saskatchewan, for instance, is subject to frequent periods of calm, which necessarily preclude wind power as a sole source electrical generation option for remote northern communities. Costs associated with battery storage of electricity, particularly when considered only on a community scale, are prohibitive. As a result, the generally accepted option to date for remote communities with wind potential, has been to install wind-power assisted diesel-generators which quite simply utilize wind power. When it is available it replaces fuel that normally would be required for diesel electric generation.

2.0 Description

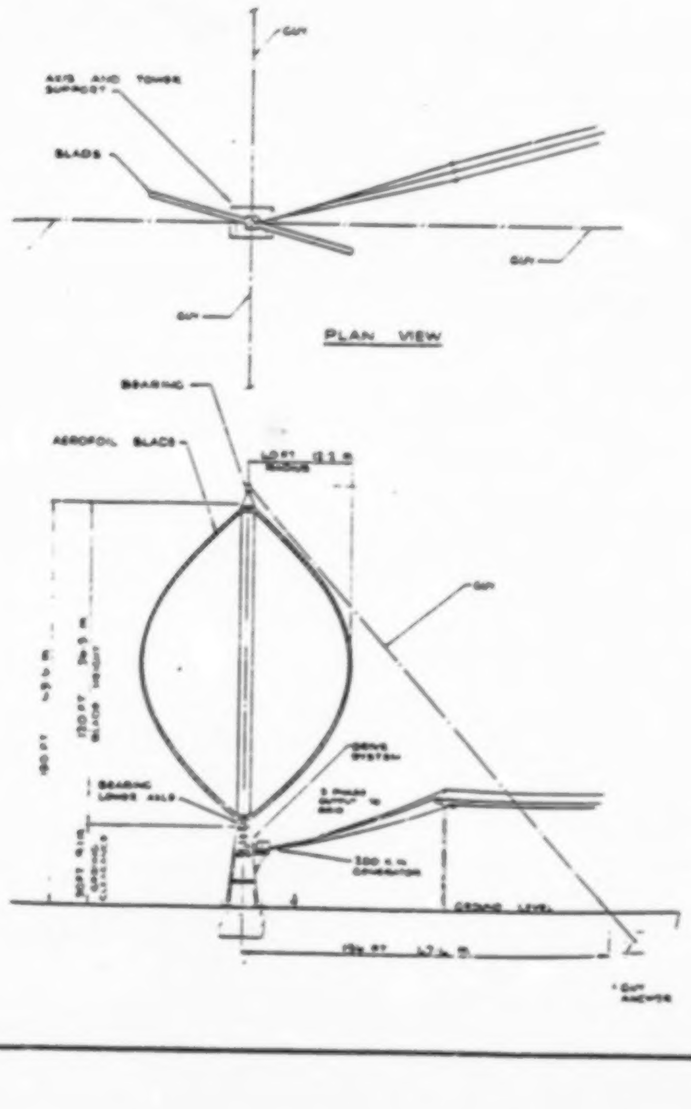
Two relatively reliable types of wind energy system designs are commercially available. The most widely utilized is the horizontal axis system which resembles an airplane propellor. The unit is designed to face into the wind. The wind then forces the blades to turn. This rotational energy is then converted into electrical power. The second unit, a more recent technological development of wind power is the vertical axis turbine which, in some ways, resembles a giant egg beater. The principal features of each system are presented in Figure 1.7. To give an indication of generating capacity, a horizontal axis, wind generator would require blades that sweep an area

1.7

Horizontal Axis Wind Turbine



SOURCE: WTG: Energy Systems Incorporated
Buffalo, New York


GUY
AXIS AND TOWER SUPPORT
BLADE
GUY
GUY
PLAN VIEW
BEARING
AEROFOIL BLADE
RADIUS
GUY
BLADE HEIGHT
DRIVE SYSTEM
BEARING LOWER AXLE
GROUND CLEARANCE
GENERATOR
GROUND LEVEL
GUY ANCHOR

Vertical Axis Wind Turbine

SOURCE: Dominion Aluminum Fabricating
Limited (DAF)

with an effective diameter of 24 metres to generate 200 kw of electricity. This would mean that the windmill structure would probably have to be 24 metres high and have two or three blades which would be over 12 metres long. For a vertical axis turbine a unit would have to be 46 metres high and 24 metres wide.

Saskatchewan Power Corporation has been experimenting with vertical axis turbine technology to determine its feasibility for more remote locations. Hydro Quebec had a 200 kw unit built on Magdalen Island in 1977. Unfortunately the experimental unit experienced very serious operational problems that resulted in overspeeding and subsequent toppling of the tower. Tests with 50 kw units are currently ongoing in Swift Current (SPC), Vancouver Island, Churchill, and Coniston (Ontario).

Despite the great amount of research and development that is ongoing and the number of commercial units on the market, wind power technology is still in the refinement stage of development. It is perhaps inappropriate at this time for application in remote settings. Initial setup and debugging of systems is time consuming. Specialized parts, if required, must be obtained out-of-province and servicing skills, if required, may be difficult to obtain. Overall, while wind power is a promising technology to be considered in the near future, installation in a remote community at this point in time should be considered strictly experimental and therefore subject to the frustrations and additional costs typical of a developmental technology.

3.0 Wind Power Sites

While the wind characteristics of a site (e.g., frequency and duration of winds above certain speed) are important in siting a wind power plant, equally important are the effects of local topography and relief. The location chosen for a wind system can have a profound effect on the power to be utilized at a particular site. For example, rough surfaces such as trees or buildings can create friction which subsequently reduces harnessable wind power. Performance can generally be improved by elevating the wind power system above surface influences. However, particular surface features may also enhance wind power potential.

Ridges rising from 105-600 m and perpendicular to prevailing winds can maximize wind power potential. Ideal siting locations are at the ridge summit where winds reach their maximum acceleration. Concavity of the ridge on the windward side may further funnel the wind, increasing overall wind speed. The slope of the ridge is also an important factor in siting. Ridge slopes and their suitability for wind power can be classified as follows:

Suitability	Slope Angle
Ideal	16^{0}
Very Good	10^{0}
Fair	3^{0}
Avoid	less than 3^{0} greater than 27^{0}

Source: Bergsteinsson, J. L., Initial Screening of Wind Power Sites, Saskatchewan Research Council, February 1979.

Isolated hills can offer good wind characteristics, particularly when the wind generator is situated on the upper half or top of the hill on a tangent to prevailing winds. Valleys can also effectively channel wind to maximize the power available, however, the valley must line up with prevailing winds.

4.0 Economics

4.1 Introduction

Understanding that wind systems are still in the initial commercial stages and have yet to reach economies of scale in terms of manufacturing, the cost per kw generating capacity of a wind power system can range from $2,000 per kilowatt and upwards. Such an installation therefore is highly dependent on long term economic considerations.

Some very rough estimates of capital, maintenance and life cycle costs are presented in this section. Cost estimates are based on previous work conducted by Middleton Associates.

In the presentation of economics only a 100 kw system is considered. Due to the nature of the technology, costs between systems can be expected to vary.

4.2 Estimated Capital Costs

Table 3.1 summarizes the estimated costs of the major components for a 100 kw vertical axis wind/diesel system. Not considered in this cost analysis is the cost of transportation to a northern site.

Table 3.1

Estimated Capital Cost of a 100 kw Vertical Axis Wind/Diesel Electrical Generation System (1982 $)

Equipment	Equipment Cost ($1.0 x 10^3)	Installation Cost ($1.0 x 10^3)	Total Cost ($1.0 x 10^3)
Wind Turbine, Support structure and electrical components	115	50	165
Diesel System with Storage Tanks	193	37	230
Total Installed Capital Cost	$308	$87	$395

Source: Middleton Associates Assessment of Alternative Generation Technologies. Prepared for the Kayahna Tribal Council et. al., September 1982.

4.3 Estimate of Operation and Maintenance

Given the limited wind potential of northern Saskatchewan, diesel fuel consumption can probably be reduced by no more than 15% annually with the incorporation of wind generated power. Based on this assumption, in accordance with industry specifications, a 100 kw wind/diesel system operating at 50% load capacity would consume 137,000 litres of fuel annually. Based on a Sask Power price for diesel fuel of $.285 litre at Wollaston (a potential wind power site), fuel costs can be expected to be $39,045 annually. The cost for replacement parts and service from outside professionals is assumed to be $113,500 per year for the wind generator and $15,700 for the diesel generator.

Fuel cost for the diesel generator operating without a wind system is calculated to be $45,900.

4.4 Life Cycle Cost

If one assumes that all costs increase at a uniform rate over time in conjunction with the interest and discount rates, then a simple life cycle analysis can be performed. A fifteen year operating lifetime has been assumed. Table 3.2 compares the lifetime cost of a 100 kw wind-diesel combination generator compared to diesel generation alone.

Table 3.2

Comparison of Life Cycle Costs of Wind Diesel Hybrid vs Diesel Only Electrical Generation

Option	Capital and Installed Cost ($1.0 x 10^3)	Annual System Maintenance ($1.0 x 10^3)	Annual Diesel/Fuel Cost ($1.0 x 10^3)	Life Cycle Cost 1982 $ ($1.0 x 10^3)
Wind/Diesel/Hybrid (Wind 15%)	395	129	39	2,915
Diesel Only	230	16	46	1,160

As can be seen from the above life cycle cost figures; at current fuel prices, the wind diesel hybrid option is not economical. Fuel for diesel electric generation would have to exceed $1.00 per litre before a wind-diesel hybrid would become cost competitive.

If, in the same wind-diesel system, wind supplied close to 100% of the power required, it would still not be cost competitive. Only if parts and maintenance costs for the wind system could be reduced from $113,500 per year to $0.00, the life cycle of the two systems would be comparable.

APPENDIX IV

SYNTHETIC FUELS FROM BIOMASS

APPENDIX IV

SYNTHETIC FUEL FROM BIOMASS

1.1 Introduction

There are six basic ways in which a synthetic fuel (or synfuel) can be produced from biomass. These methods are briefly described below, along with comments on their practicality for the fifteen remote Saskatchewan communities.

1.2 Fermentation to Ethanol

Sugar and starch crops can be converted to ethanol using the same fermentation and distillation techniques that have been used for centuries to produce beverage alcohol. To comply with federal and provincial laws governing the production of ethanol, the ethanol produced for use as a fuel has to be denatured to make it unfit for drinking. Although ethanol can be used as a substitute for gasoline and diesel fuel, it is currently not practical to produce it in these communities as suitable crops are not being locally grown. Experimentation is underway in the conversion of wood to ethanol and, if this technology becomes commercial, it could find application in the northern study communities.

1.3 Destructive Distillation to Methanol

Methanol is a second type of alcohol that can be produced in small quantities through the destructive distillation of wood. The process used is essentially the same as that used for production of charcoal from wood. Like ethanol, methanol can also be used to sustitute for gasoline and diesel fuel. The amount produced per cord of wood is, however, very small. The major byproduct of this process is charcoal.

1.4 Gasification/Methanol Synthesis

Alternatively, methanol can be synthesized from wood by first gasifying the wood and then using the gas to make synthetic methanol. The size of the facilities required, however, is far in excess of the amount of fuel that could be used by any of the communities under consideration.

1.5 Direct Liquidation

A number of sophisticated processes are currently being developed that convert wood directly into liquid fuel. They do not appear ready for application at this time and require a scale of operation that is well beyond the needs of the remote communities in northern Saskatchewan.

1.6 Anaerobic Digestion to Methane

Methane gas can be produced through the anaerobic digestion of animal or human waste. This is the type of gas used in the larger municipalities throughout Canada for domestic heating and cooking and for industrial applications. Although the technology for producing this gas from manure is well known, its application on a small scale basis is not well developed. Further investigation is recommended.

1.7 Gasification to High Quality Syngas

The gasification processes discussed previously produce a relatively low quality gas not suitable for storing or for uses other than to fuel an industrial boiler or engine. Alternative gasification processes are being developed that are capable of producing a higher quality gas that can be cleaned, cooled, stored, distributed and used in homes for heating or cooking. This technology is, however, not yet fully developed and will probably be of a size not appropriate for remote Saskatchewan communities.

APPENDIX V

CLIMATOLOGY OF NORTHERN SASKATCHEWAN

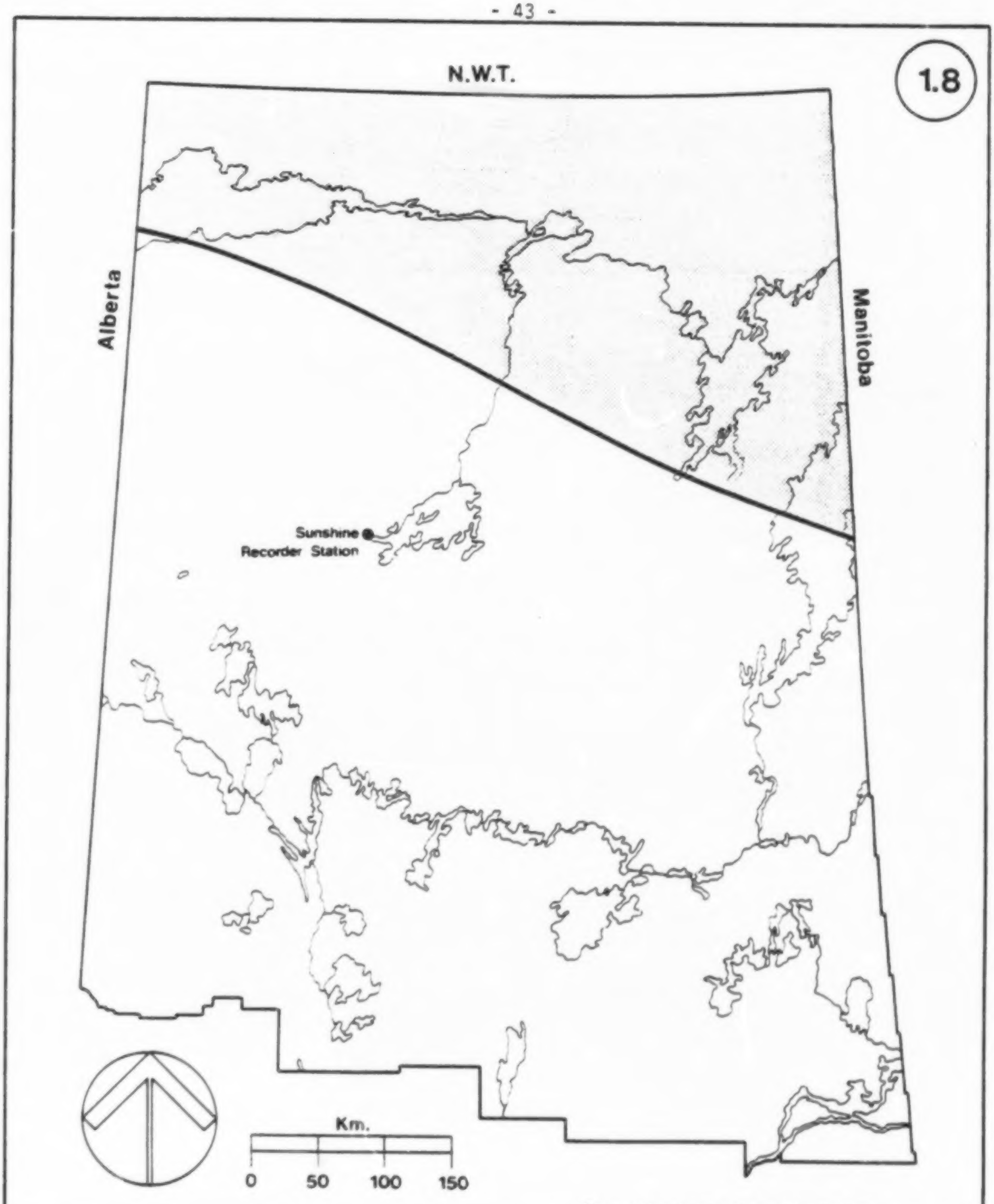
APPENDIX V

CLIMATOLOGY OF NORTHERN SASKATCHEWAN

The atmospheric Engineering Service of Environment Canada maintains only one weather station in the northern study area of this report. This station is located at Cree Lake and is depicted in Figure 1.8 as the solitary sunshine recorder station in the north. As a result the data presented in Figures 1.8 through 1.12 should be considered very general and not necessarily completely applicable to individual remote communities.

Figures presented are as follows:

Figure 1.8 - Net Radiation
Figure 1.9 - Normal Mean Daily Temperature - July
Figure 1.10 - Normal Mean Daily Temperature - January
Figure 1.11 - Wind
Figure 1.12 - River Freeze Thaw Dates


1.8
N.W.T.
Alberta
Manitoba
Sunshine Recorder Station
Km.
0
50
100
150

Source : Hydrological Atlas of Canada 1978

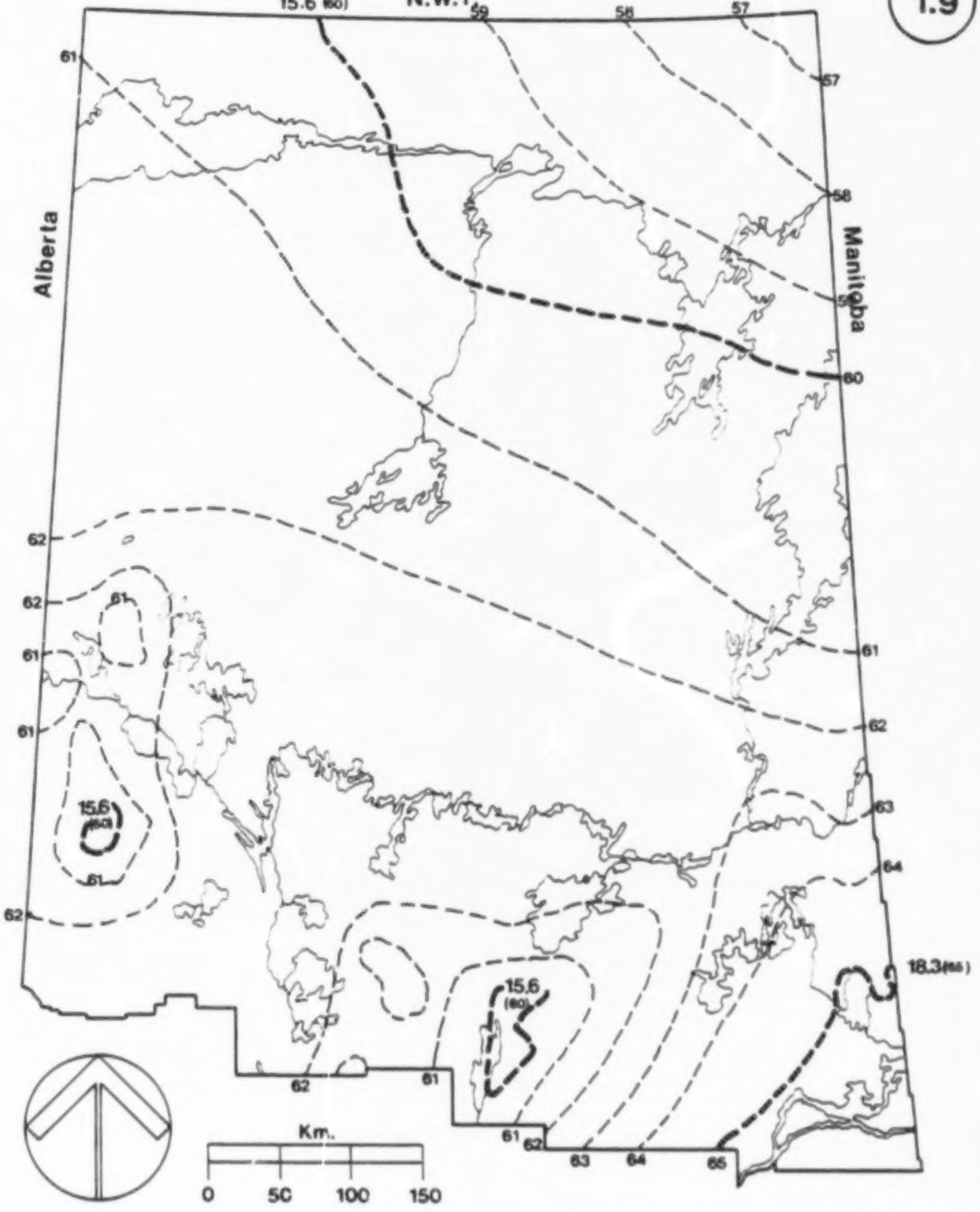
Net Radiation
NORTHERN SASKATCHEWAN
Remote Community Energy Study

Legend

▨ ☐ Mean Annual Net Radiation
20 30 40 kilocalories/cm.^{2}

Annual Global Solar Radiation: 100-110 kilocalories/cm.^{2}

1.9


15.6 (60)
N.W.T.
59
58
57
57
61
58
Alberta
Manitoba
59
60
62
62
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61
15.6 (60)
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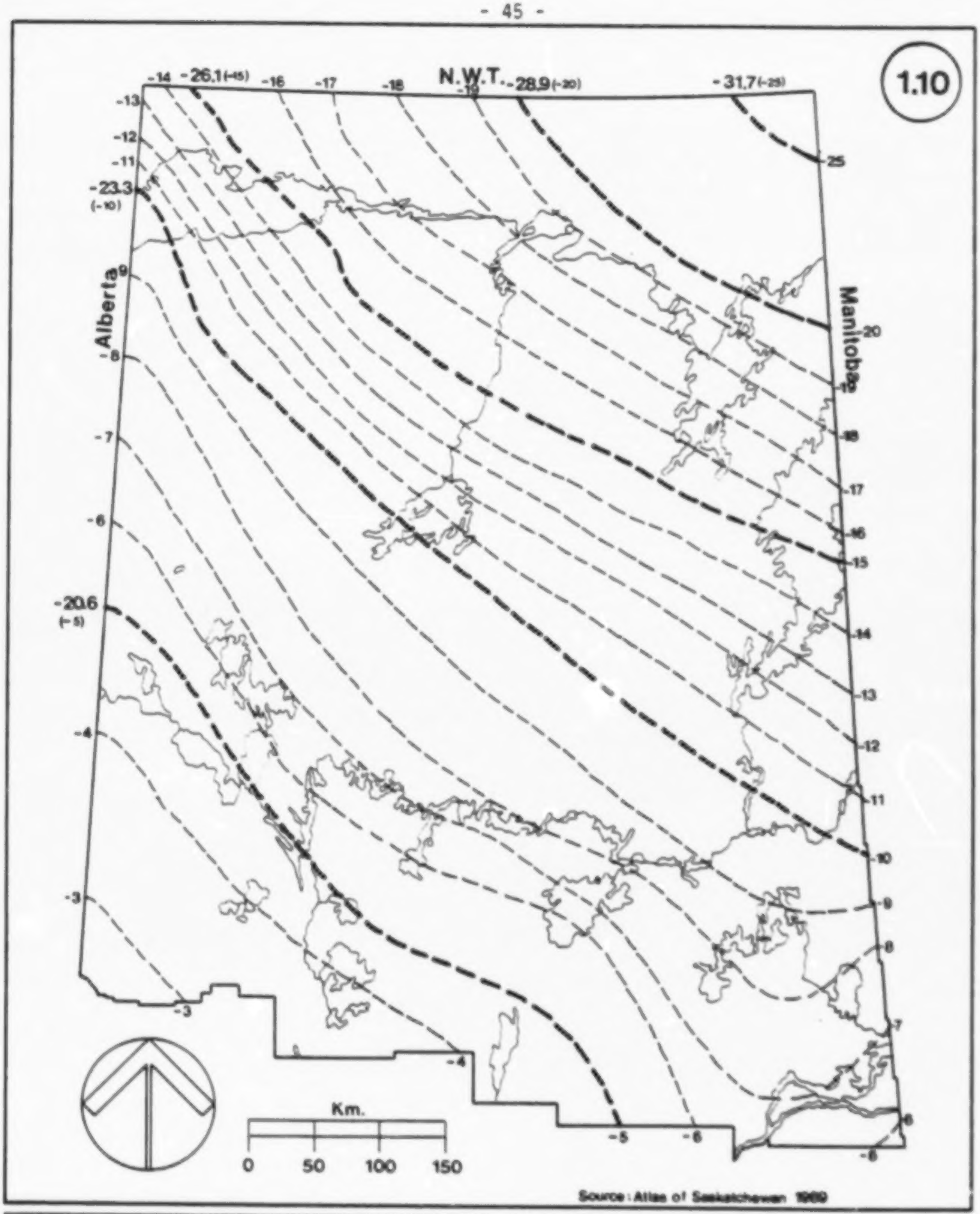
18.3 (65)
15.6 (60)
62
61
61
62
63
64
65
Km.
0
50
100
150

Source Hydrological Atlas of Canada 1978

Normal Mean Daily Temp. July
NORTHERN SASKATCHEWAN
Remote Community Energy Study

Legend
— — — Isotherms Approximate
15.6 In Degrees Celsius
(60) In Degrees Fahrenheit

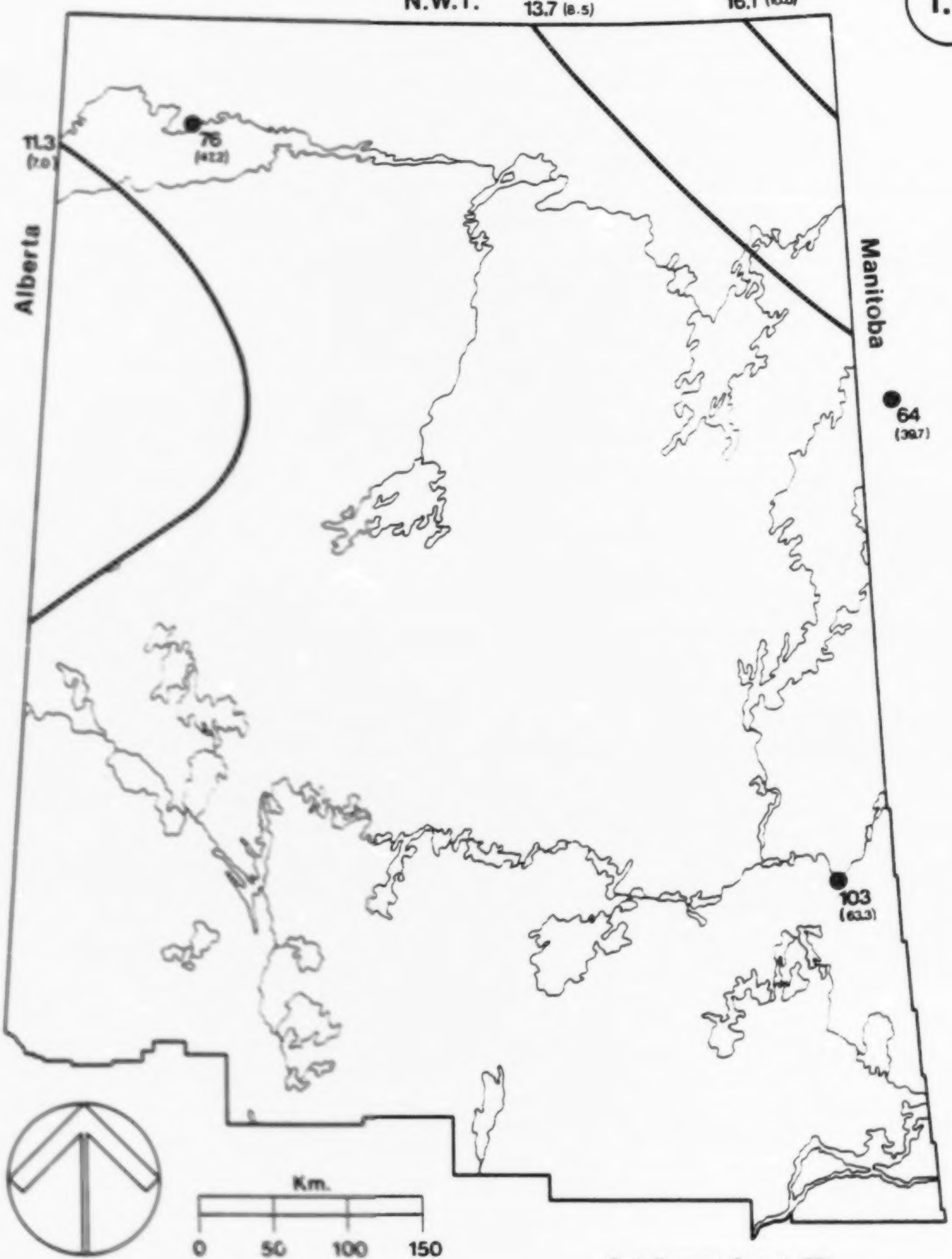

1.10
N.W.T.
-14
-26.1 (-15)
-16
-17
-18
-19
-28.9 (-20)
-31.7 (-25)
-13
-12
-11
-23.3
(-10)
9
Alberta
8
-7
-6
-20.6
(-5)
-4
-3
25
Manitoba
20
19
18
-17
16
-15
14
-13
-12
-11
10
9
8
7
6
-3
-4
-5
-6
-6
Km.
0
50
100
150

Source: Atlas of Saskatchewan 1969

Normal Mean Daily Temp Jan.
NORTHERN SASKATCHEWAN
Remote Community Energy Study

Legend
= = = Isotherms Approximate
-31.7 In Degrees Celsius
(-25) In Degrees Fahrenheit

1.11


N.W.T.
13.7 (8.5)
16.1 (10.0)
11.3 (7.0)
76 (47.2)
Alberta
Manitoba
64 (39.7)
103 (63.3)
Km.
0
50
100
150

Sask. Research Council 1979
Source: Hydrological Atlas of Canada 1978

Wind
NORTHERN SASKATCHEWAN
Remote Community Energy Study

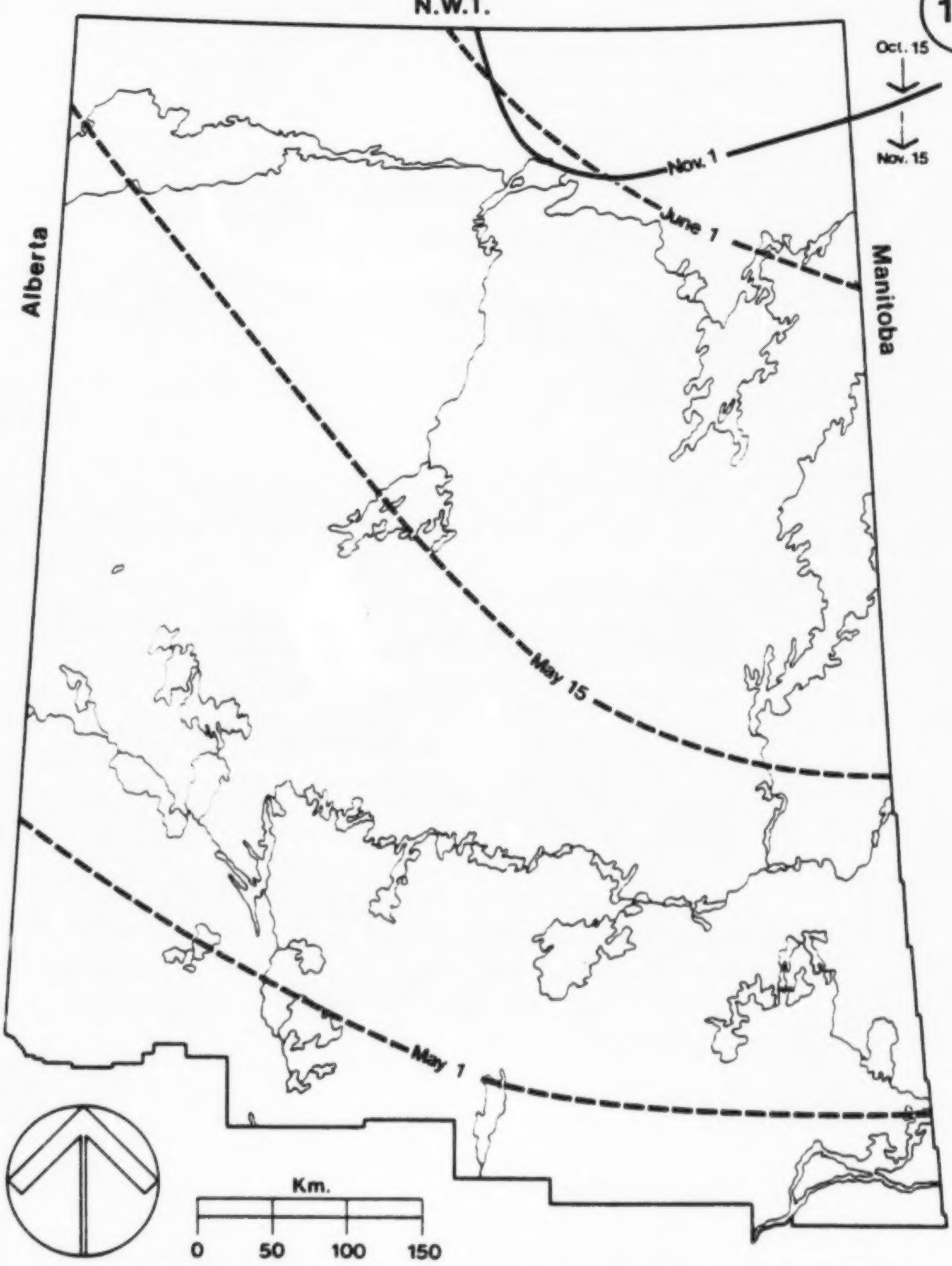
Legend

● Annual Maximum Hourly Wind Speeds (km./hr.)

—— Isotaches Measured 10m. Above Grade

16.1 in km./hr.
(10.0) in mi./hr.

1.12


N.W.T.
Oct. 15
Nov. 15
Nov. 1
June 1
Alberta
Manitoba
May 15
May 1
Km.
0
50
100
150

Source: Hydrological Atlas of Canada 1978

River Freeze/Thaw Dates
NORTHERN SASKATCHEWAN
Remote Community Energy Study

Legend
– – – Ice Free
—— Freeze Over

APPENDIX VI

COMMUNICATIONS NETWORK IN NORTHERN SASKATCHEWAN

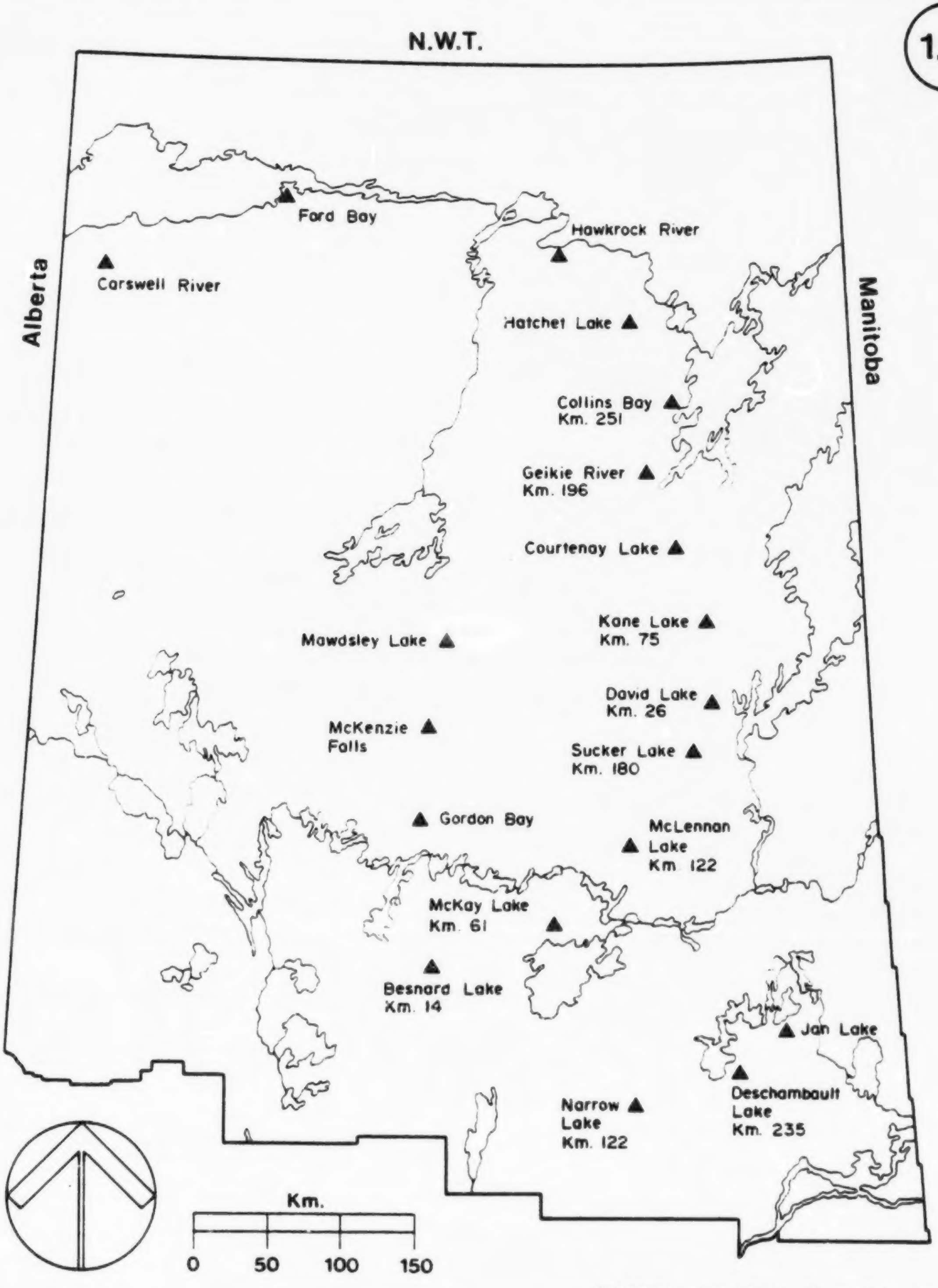
APPENDIX VI

COMMUNICATIONS NETWORK IN NORTHERN SASKATCHEWAN

All but two of the remote communties examined in this study are connected to Saskatchewan's radio/telephone network allowing for direct dial access to southern exchanges. Figure 1.13 displays the network of radio/telephone towers in the province. Each tower is powered by its own 5-10 KW diesel power plant.

Garson Lake and Kinoosao are the two communities yet to be connected to this network. The absence of a direct telephone connection to these communities has slowed the data collection process during this study.

1.13


N.W.T.
Alberta
Manitoba
Fond Bay
Hawkrock River
Carswell River
Hatchet Lake
Collins Bay
Km. 251
Geikie River
Km. 196
Courtenay Lake
Kane Lake
Km. 75
Mawdsley Lake
David Lake
Km. 26
McKenzie
Falls
Sucker Lake
Km. 180
Gordon Bay
McLennan
Lake
Km. 122
McKay Lake
Km. 61
Besnard Lake
Km. 14
Jan Lake
Deschambault
Lake
Km. 235
Narrow
Lake
Km. 122
Km.
0
50
100
150

SOURCE : Bob Johnson, Sask. Tel., Jan., 1983

Radio Telephone Tower Site
NORTHERN SASKATCHEWAN
Remote Community Energy Study

BIBLIOGRAPHY

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SMALL HYDRO

Saskatchewan Power Corporation, Assessment of Electrical Generation and Conservation Alternatives for Northern Saskatchewan Communities, a proposal submitted to the Department of Energy, Mines and Resources for funding under the Remote Communities Demonstration program.

-----, Engineering Report, Rapid River Hydro-Electric Project Study, Phase I - Preliminary, PFRA Engineering Service, 1978 September.

-----, Engineering Report, Woodcock Rapids Hydro-Electric Project, Preliminary, PFRA Engineering Service, 1979 November.

-----, Feasibility of Small Hydro-Electric Plants for Remote Communities in Northern Saskatchewan, SPC, R & D Centre, Report No. PE-5335, 1973 July 13.

-----, Northern Hydro Development: Economic Feasibility of Small Hydro Development in the Black Lake Area, SPC Electric Supply Planning, 1981 September 21.

-----, Report and Recommendations of the Rapid River Board of Enquiry, 1980 September 15.

WOOD HEATING, GASIFICATION AND RESOURCES

Granatstein, D.L., Wild, D.J., Van Der Heijden, S. and Szladow, A.J., Hudson Bay Wood Gasification Plant--Phase IV, SPC R & D Report No. 82-C-002 Electric Generation (1981 December).

InterGroup Consulting Economics Limited, Economic Pre-Feasibility Study: Large-Scale Methanol Fuel Production from Surplus Canadian Forest Biomass, Part I Summary Report, Fisheries and Environment Canada, Ottawa, 1976 September.

Ismail, A., Detre, S, and Tibbetts, T.E.. Studies of Peat-Fired Thermal Stations in Canada, 209 in Proceedings: 6th International Peat Congress, Duluth, MN (1980 August).

Saskatchewan Power Corporation, Evaluation of the Saskatchewan Power Corporation Wood Gasifier at Hudson Bay, Saskatchewan, 1978-79, SPC R & D Report No. 4476-1978-1-Alternate Energy, 1979 May 24.

-----, The Social, Environmental and Resource Impact of Wood Gasification on Isolated Northern Communities, Part 1 and 2, Saskatchewan Power Corporation, ENFOR Project C-8(2).

Schell, M.B. and Rogoza, D.D., Wood Space Heating in Saskatchewan, Saskatchewan Conservation and Renewable Energy Office, Energy, Mines and Resources, Prepared by Middleton Associates, November 1982.

Stobbs, R. A. and Verma, A., Wood for Power Generation in Isolated Northern Communities, SPC R & D Report No. 1E10-5776, 1977 August 17.

Van Der Heijden, A., AuYeung, G. and Wilson, M., Field Testing of Imbert Gasifier Motor Generator Set for Electricity Generation, SPC R & D Report No. 82-C-006-Alternate Energy, 1982 May.

Weisgerber, G. A. and Van Der Heijden, S. P., Cleaning Wood Gas for Combustion, SPC R & D Report No. 4400-1979-1-Alternate Energy, 1980 August.

Weisgerber, G. A., Pilot Plant Investigation of the SPC Wood Gasifier at Hudson Bay--Final Report, SPC R & D Report No. 4406-1979-2-Alternate Energy, 1980 June.

GENERAL ENERGY INFORMATION

Energy, Mines and Resources, Renewable Energy in Remote Locations: Energy Demand and Resource Base, Energy, Mines and Resources, Conservation and Renewable Energy Branch, Tru Techno Economic Research Unit with Victor and Burrell, October 1980, Report ER 80-10E.

Gillard W., Memo: "Energy Audit of Schools at Black Lake and Stony Rapids," Saskatchewan Power Corporation, Utilization and Conservation Section, 1982 November.

GRID EXTENSIONS

Pritzel G., Electrification of Northern Communities, Saskatchewan Region, Department of Indian Affairs and Northern Development, Engineering Section, 1982-01-05.

WIND

Saskatchewan Research Council, Initial Screening of Wind Power Sites, Saskatchewan Research Council Report No. P79-2, 1979 February.

-----, A Regional Climatology of Saskatchewan for Wind Power, Saskatchewan Research Council Report No. P75-11, 1975 November.

PEAT

Saskatchewan Mineral Resources, Buffalo Narrows Peat Utilization Study, Prepared by Saskmont Engineering, 1981 April.

PLANNING STUDIES

Damas & Smith Limited, Wollaston Lake Community Planning Study, Lac la Hache Band, Wollaston Lake Local Advisory Council and Department of Indian and Northern Affairs, December 1981.

Hilderman Feir Witty & Associates, Black Lake Community Planning Study, Black Lake Band and Department of Indian and Northern Affairs, March 1980.

Hilderman Feir Witty & Associates, Deschambault Community Planning Study, Preliminary Draft, 1978.

Hilderman Feir Witty & Associates, Morin Lake Planning Study, July 1982.

Ikoy Partnership: Architects, Fond du Lac Development Plan and Program for a Multi-Purpose Building, Department of Indian and Northern Affairs, November 1980.

Reiber-Kremers & Associates Ltd., Patuanak Community Plan, Patuanak Chief and Council, May 1979.

Underwood McLellan Ltd., Buffalo River Band Development Plan, Buffalo River Band and Department of Indian and Northern Affairs, September 1980.

Underwood McLellan Ltd., Pinehouse Planning Study, Department of Northern Saskatchewan, February 1981.